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Full Name of Author — Nom complet de l'auteur

RICHARD DYNES McCONNELL

Date of Birth — Date de naissance

JANUARY 30, 1954

Country of Birth — Lieu de naissance

CANADA

Permanent Address — Résidence fixe

#6-12704 -107 Ave.

EDMONTON, ALBERTA

Title of Thesis — Titre de la thèse

COMPENSATION FOR WATERFOWL DEPREDATION IN ALBERTA WITH PARTICULAR REFERENCE TO HABITAT AVAILABILITY

University — Université

UNIVERSITY OF ALBERTA

Degree for which thesis was presented — Grade pour lequel cette thèse fut présentée

MASTER OF SCIENCE (Agricultural Economics)

Year this degree conferred — Année d'obtention de ce grade

1984

Name of Supervisor — Nom du directeur de thèse

DR. WM PHILLIPS

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COMPENSATION FOR WATERFOWL DEPREDATION IN ALBERTA WITH PARTICULAR REFERENCE TO HABITAT AVAILABILITY

by

R.D. McConnell

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF SCIENCE

IN

AGRICULTURAL ECONOMICS

DEPARTMENT OF RURAL ECONOMY

EDMONTON, ALBERTA

FALL, 1984

THE UNIVERSITY OF ALBERTA

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled COMPENSATION FOR WATERFOWL DEPREDATION IN ALBERTA WITH PARTICULAR REFERENCE TO HABITAT AVAILABILITY submitted by R.D. McConnell in partial fulfilment of the requirements for the degree of MASTER OF SCIENCE.

William E Phillips

Supervisor

Date June 29, 1987

Acknowledgment

Several individuals have provided me with assistance and support throughout the preparation of this thesis. I wish to thank the Alberta Fish and Wildlife Division for the provision of funds for this project. Special thanks is extended to Mr. Harold Weaver and Mr. Ken Lungle, with the Alberta Fish and Wildlife Division, for their advice and support upon my request.

Information concerning the waterfowl damage compensation program was provided by the Department of Energy and Natural Resources Computing Services Branch. Mr. Ed Patching, General Manager, Alberta Hail and Crop Insurance Corporation, is thanked for his clarification of the calculations involved in determining compensation payments. Information concerning water resource projects in Alberta was provided by Mr. P.D. Chaikowsky with the Alberta Water Resources Management Division.

Computer analysis provided by Mr. Claire Shier with the Department of Rural Economy at the University of Alberta is greatly appreciated. In addition I would also like to thank Judy Warren for her data entry services and the staff of the University Computing Services for their involvement in the thesis project.

A special thanks is extended to my supervisor and friend, Dr. W.E. Phillips for his support, advice and patience throughout the entire course of my studies. My completion would not have been possible without his helpful assistance.

Finally, I would like to thank the staff and graduate students of the Department of Rural Economy for an enjoyable two years. In this regard I wish to express my sincere appreciation to my fellow office mates collectively known as the "525 Club".

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I. INTRODUCTION

In the past few decades, damage by waterfowl to agricultural crops has become a controversial issue. As a result, provincial and federal governments have developed various methods of prevention or loss compensation for the agricultural community due to waterfowl depredation. During the same period, habitat areas suitable for waterfowl have declined continuously in quality and quantity. The purpose of this thesis is to examine the relationship between the crop damage compensation program and the availability of waterfowl habitat in Alberta.

Among the forty-eight species of waterfowl in North America only two can be considered non-migratory. Members of the remaining forty-six migratory species of ducks, geese and swans cross international borders twice annually. Migrating waterfowl follow general flyway patterns which range throughout North, Central and South American countries. The four major flyway systems, the Atlantic flyway, the Mississippi flyway, the Central flyway and the Pacific flyway, are shown in Figure 1.

Waterfowl can be found in most regions of North America in varying numbers. However, several specific geographical areas are considered productive and important to waterfowl populations in general. These major geographical regions for waterfowl production are:

1. the prairie pothole region,
2. northern watersheds and deltas,
3. northern forests and tundra.

Of these regions, the prairie pothole areas are considered most productive when conducive water conditions prevail. Although estimates vary, the prairie pothole region comprises approximately 10 percent of the total waterfowl breeding area in North America. At the same time, this region produces 50 percent of the duck population in an average season.

The northern watersheds and delta region are relatively uninhabited by human populations when compared with the prairie pothole region. Reduced pressure from agriculture and abundant natural food sources make specific sites in this region productive. The greatest benefit to waterfowl from northern areas occurs when the prairie pothole region undergoes prolonged dry periods. During these droughts many

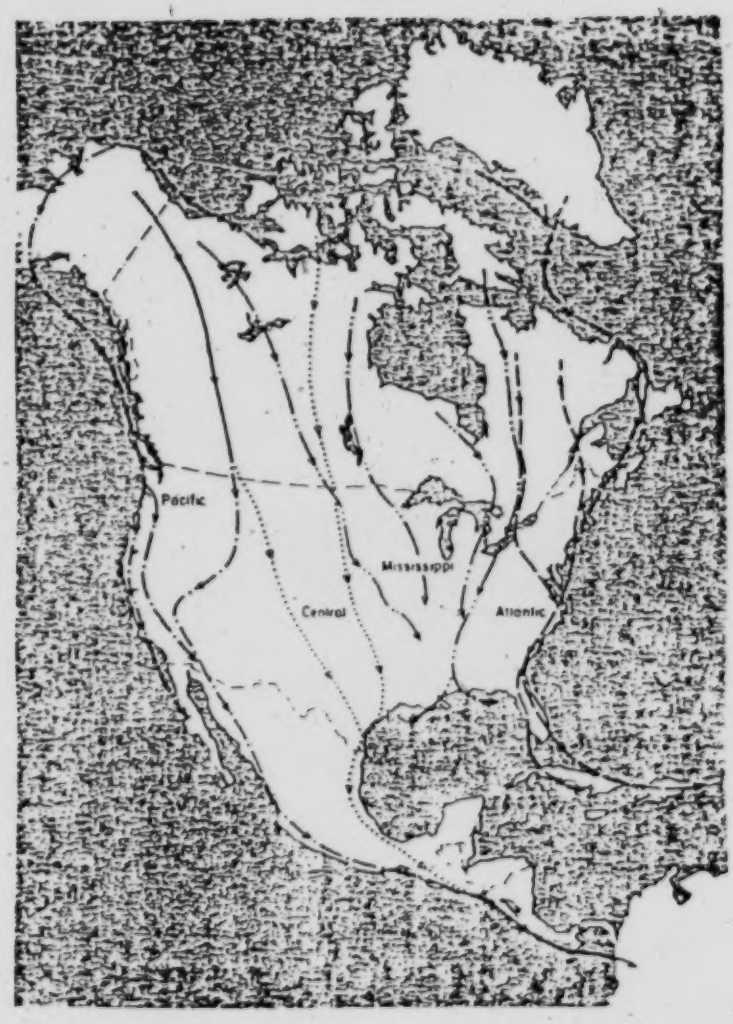

Figure 1. Major Flyways in North America
(Adapted from Hammack and Brown 1974)

waterfowl, which would normally remain in more southerly areas, migrate farther north to take advantage of the abundant water conditions. Although the adults are able to survive despite dry years in the prairie region many breeding pairs are, however, unsuccessful at producing young. After prolonged dry periods habitat availability becomes increasingly important for rejuvenating depressed waterfowl populations. Thus, successive years of drought and/or loss of prairie pothole habitat by other means may adversely affect overall waterfowl populations. (For a more detailed account of the biological factors concerning waterfowl populations see Smith et al, 1964).

Due to the numbers of waterfowl species and their distinctive migratory characteristics, habitat requirements vary substantially. Prairie and northern habitat requirements vary throughout the life cycle of individual waterfowl within a particular species. Certain types of habitat provide suitable environments for nesting and rearing of the young. During these periods, breeding pairs require cover from predators and seclusion from other nesting individuals. However, altering food sources necessary for the development of waterfowl may result in changing habitat requirements. In the prairie region, sources of food available in one habitat area may not be found in others. Similarly, as smaller pothole areas disappear waterfowl may require larger marsh areas or open water bodies for feeding, moulting and staging activities in preparation for fall migration.

Habitat requirements vary among waterfowl species. Waterfowl may be grouped into broad classifications depending on the nature of feeding patterns. For example, ducks classified as dabblers prefer shallow water for feeding whereas diving species are adapted to deeper and open water areas. Success of any species depends on the availability of habitat areas throughout the entire migration route. These areas must include northern breeding grounds, over wintering sites and sufficient feeding and resting areas between final destinations. Thus, a variety of habitat are required to sustain each species of waterfowl. Noticeable losses of any particular type of habitat may drastically reduce waterfowl populations.

Areas suitable for waterfowl production in Alberta are shown in Figure 2. For comparison, Figure 3 shows those areas within the province where agriculture production occurs. The area containing much of the prime waterfowl habitat in Alberta is also valuable agricultural farmland.

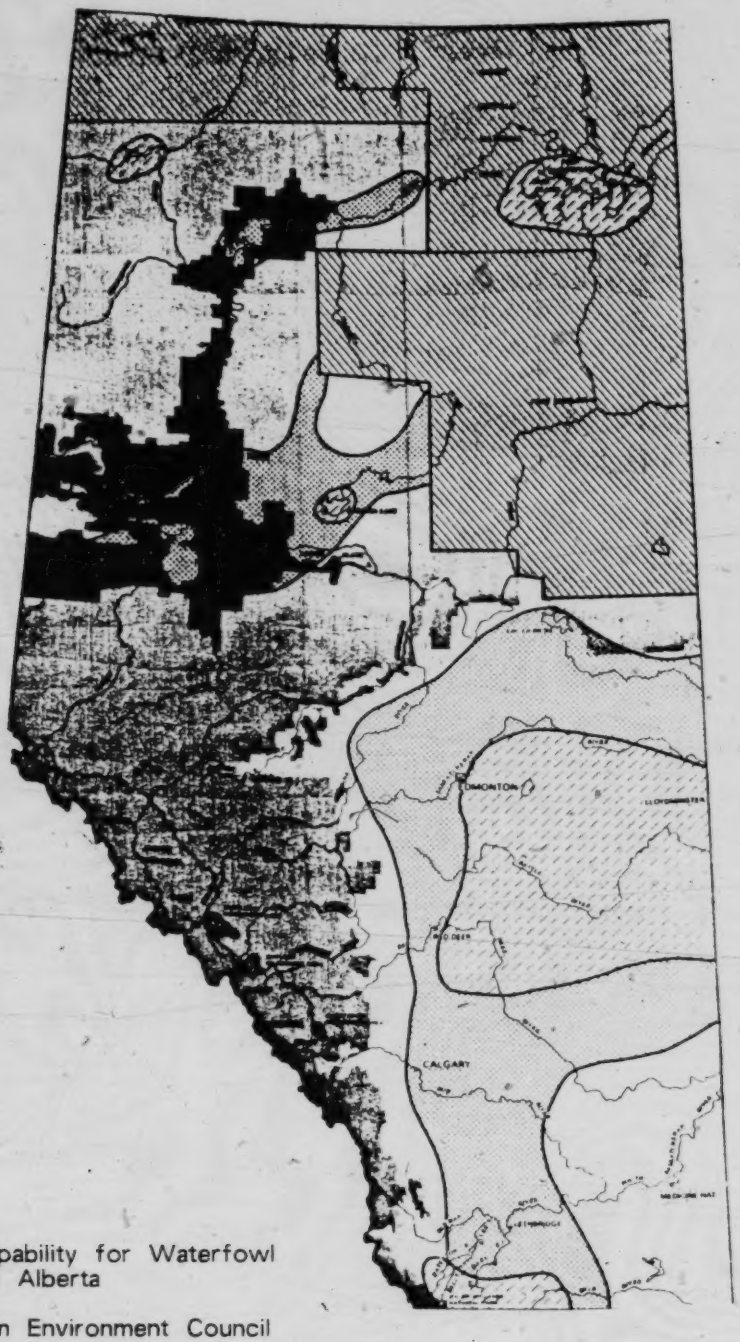

Figure 2. Capability for Waterfowl Production in Alberta

Adapted from Environment Council of Alberta)

Legend

- Not Surveyed
- High Capability
- Moderate Capability
- Low Capability

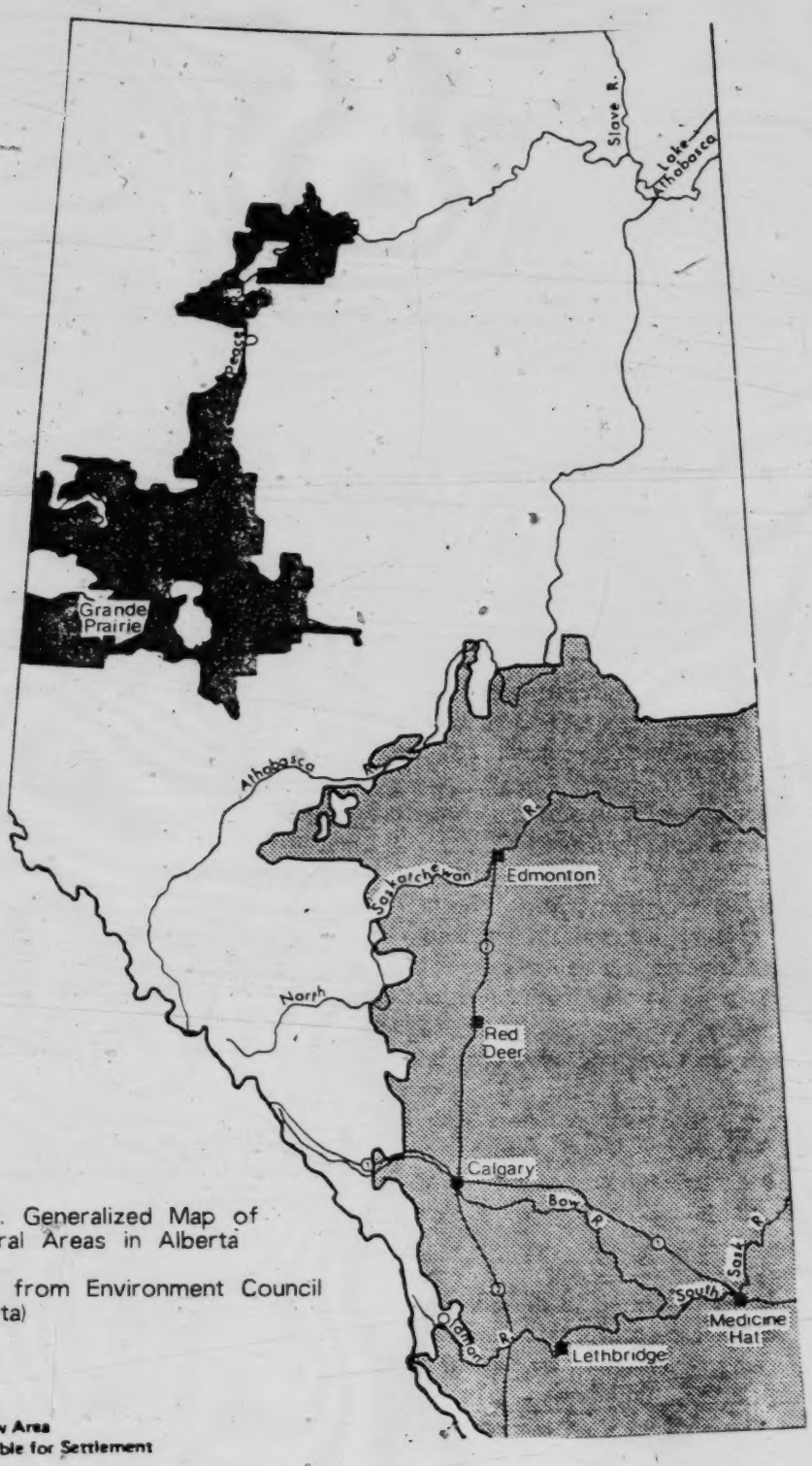

Figure 3. Generalized Map of Agricultural Areas in Alberta

(Adapted from Environment Council of Alberta)

Legend

Yellow Area
Available for Settlement

White Area
Agriculture - Not available for Homestead sale

Green Area
Withdrawn from Settlement

Approximately 27 percent of the land base in Alberta is privately held (Thompson, 1981). A major portion of this privately held land is situated in the southern half of the province. Therefore, much of the highly productive waterfowl habitat available in Alberta is situated on private land which is primarily used for agricultural purposes.

Most members of society benefit in some manner from the existence of waterfowl. The waterfowl resource may provide benefits from both consumptive and non-consumptive uses by individuals or groups in society. A consumptive benefit is derived from the physical consumption of waterfowl as a result of hunting activities. Non-consumptive benefits may be derived by several means. Activities such as viewing, photographing and painting waterfowl provide non-consumptive benefits. In this instance, a degree of physical contact with the resource is required. However, individual birds are not captured or withdrawn from the overall population.

Other non-consumptive benefits may be derived through option and existence demands. Benefits from option demand are derived from the gratification an individual receives in the knowledge that waterfowl exist in sufficient quantities to provide future consumptive and/or non-consumptive benefits. Whether or not an individual actually exercises the option to use the resource is inconsequential. Nonetheless, physical quantities of the resource are required to meet potential demand situations. Benefits from existence demand are derived from the gratification an individual receives from the knowledge that waterfowl exist and will continue to do so in a natural environment. No physical use in any time period is required in order that an individual may obtain benefits from the resource.

In conjunction with the diversity of benefits, costs of maintaining waterfowl populations are distributed among most members of society. Tax revenues contribute significantly to wildlife research and government wildlife management. Sale of hunting licenses and contributions to private groups concerned with waterfowl cover many additional costs. Thus, most individuals who gain benefits from waterfowl eventually contribute in some form to the costs. However, the distribution of benefits and costs throughout society may not be deemed equitable. In general, consumptive users are able to realize greater benefit than other groups. This extra benefit is acquired through the legal capture and subsequent ownership of waterfowl. No other groups of individuals

who obtain benefits from the waterfowl resource are entitled to ownership privileges. For this extra privilege, consumptive users contribute a fee for hunting licenses and taxes on hunting equipment. The major portion of funds received from these sources contribute to wildlife management programs in general.[1] Survey work in Alberta indicates extra-market benefits to Alberta waterfowl hunters in 1975 in the order of $21.60 per day (Phillips, Depape and Ewanyk, 1978). Non-resident hunters hunting waterfowl in Alberta in 1976 averaged $31.56 per day in extra-market benefits (Phillips and McElhaney, 1977). These figures would be in the order of $40.00 and $50.00 per day respectively today if one adjusted for inflation. By adding license fees to extra-market benefits, consumptive benefits per day result in amounts slightly higher than the extra-market figures.

Most members of society who benefit in some manner from the existence of waterfowl include landowners who own areas on which waterfowl are found. However, the close proximity of waterfowl to landowners does not necessarily mean greater benefits. Landowners who produce commercial grain crops in Alberta may suffer depredation to crops from waterfowl species. Since crop damage results in foregone revenues, individual landowners may incur losses greater than the benefits received. Similarly, reduced grain production due to waterfowl depredation may be considered a loss to society in general. Production of agricultural commodities provide employment for members of society in research, transportation, processing, marketing, and other related industries. In addition, sale of grains to foreign markets is a significant contribution to the balance of trade in Canada. Thus, waterfowl depredation to agricultural groups result in direct losses to the individual landowner and indirect losses to society in general.

In Canada, wildlife resources including waterfowl are publicly owned. Government agencies are responsible for maintaining populations and thereby exercise control over the use of the wildlife resources. Since waterfowl exhibit migratory patterns and cross international borders on an annual basis overall control of the resource is under federal jurisdiction. So long as the birds remain in Canada, however, provincial and federal governments cooperate to regulate the use of the waterfowl resource. Hence, ownership of the waterfowl resource is non-exclusive except in instances of capture within legal

---

[1]Whether these extra costs obtained for extra consumptive benefits received are adequate is a controversial issue but not the focus of this paper.

limit for consumptive use. In this instance, exclusivity, obtained through right of ownership, allows the individual the right of consumption for personal use but not for resale purposes. Since ownership is a legal device which assigns rights to use, capture outside of established laws and regulations does not qualify as ownership. Thus, ownership is not without restrictions.

In short, crop depredation from waterfowl may be characterized as a property rights problem in which a public resource (waterfowl) incurs costs on private entities (farmers, landowners). The farmers share of benefits to society from waterfowl (viewing, hunting, etc.) is, however, low or non-existent in the absence of compensation for crop damages. Hence, while society at large may benefit significantly from waterfowl, farmers or landowners, because they bear a large portion of habitat provision costs, may bear significant net losses.

Crop damages from waterfowl vary considerably from year to year. While damages may not be considered significant overall, certain individuals in isolated locations may suffer significant damage. Notwithstandng spatial and temporal variations, waterfowl depredation of crops depends largely on two factors (Renewable Resources, 1969):

1. the susceptibility of crops during waterfowl migration periods in terms of the length of harvest due to fall precipitation and the length of time the crops are in swath; and
2. the distance of crops from waterbodies.

Both compensation and damage prevention programs have been implemented in Alberta. Since 1964, compensation for waterfowl damage to grain crops has been available from the Wildlife Damage Fund which is supported from the sale of Wildlife Certificates. With the more recent implementation of a damage control program in areas of high crop damage historically, losses and consequently compensation payments have declined. (See Burgess 1971, Lungle 1972 and Lungle 1973.) The damage control program consists of two major components:

1. protected feeding areas (bait stations, lure crops)
2. scaring crews (waterfowl chasing activities)

The central program has expanded to include 26 damage control units in 19 Alberta geographical locations. Although effective, the program alters the distribution and availability of waterfowl which has implications for hunting potential.

In the absence of either adequate compensation or an effective damage control program individual landowners may attempt to reduce the costs associated with crop depredation. In this instance, the benchmark for adequate compensation or efficient prevention is determined by individual landowners.

A number of options are possible depending on a given situation. If the crop depredation problem is initiated by waterfowl using habitat on an individual landowners property, partial or complete removal of the habitat area may result. In the event removal is not a logical alternative or the waterfowl inflicting damages originate outside the landowners property, changes in cropping practices may ensue. A less susceptible crop may be substituted for the historically damaged one. These situations may result in both direct losses to the landowner and indirect losses to society in general. Should a less productive or less valuable crop be substituted export trade and activity in related sectors may decline marginally.

Another solution may be to implement a straight combining approach on cereal grains to avoid swathing techniques. As previously stated, damage to grain crops by waterfowl depredation occurs during the swathed stage. Thus, the straight combining approach supplemented with grain drying equipment may be economically feasible. There is, however, added costs associated with straight combining and drying techniques.

In the situation where removal of waterfowl habitat is a viable alternative, further declines in waterfowl populations may result. Similarly, as waterfowl habitat is reduced, certain species may rely more heavily on cereal grains in other areas to supplement natural food sources. Thus, removal of habitat may only redistribute crop damages or perhaps increase the overall effect.

The effect of inadequate compensation/prevention programs in the landowners opinion need not be the only factor influencing removal decisions. A desire to increase land productivity, increase property values, or to reduce the inconvenience of cropping close to wet areas may contribute in varying degrees to the decision processes. However, should these situations become common, an alteration in the compensation/prevention programs may provide a more efficient use of funds in maintaining waterfowl populations.

In either scenario previously described, landowners would be reacting to situations which are inequitable, in their opinion. Costs may arise in removal of wet areas, altered

harvest patterns or planting of less susceptible crop varieties. Foregone revenues which cannot be realized because of these changes should be considered when assessing the distribution of benefits and costs of maintaining waterfowl populations. There appears to be a significant tolerance by farmers and landowners to the damage problem. However, society must be concerned with three basic issues:

1. efficient use of funds to maintain waterfowl habitat and thus, waterfowl populations;
2. an equitable distribution of benefits and costs among members of society; and
3. an equitable distributon of compensation and prevention programs for all farmers / landowners contributing to waterfowl populations through lost revenue due to waterfowl depredation.

The purpose of this thesis is to examine the role of the waterfowl crop damage compensation program in Alberta with respect to landowner decisions regarding waterfowl habitat.

Based on the set of circumstances described, the objectives of this thesis are as follows:

1. To determine the current extent of annual crop depredation in Alberta relative to past reports;
2. To identify the extent to which land use changes have altered wetland availability in Alberta;
3. To examine the present compensation program with regard to the distribution of funds to landowners affected by waterfowl depredation;
4. To identify the role of the compensation program in land use changes altering waterfowl habitat in Alberta;
5. To suggest possible alterations to the compensation program with regards to the three basic issues (listed above) concerning the efficient use and equitable distribution of available funds to maintain waterfowl habitat.

II. BACKGROUND

Waterfowl depredation issues are widespread geographically due to the migratory patterns exhibited by waterfowl. However, the extent of damages and the agricultural crops affected vary significantly throughout the flyway systems. As a result, government agencies in provinces, states and territories along the flyway routes have developed an assortment of programs in response to waterfowl depredation issues.

This chapter deals primarily with control programs initiated by the Alberta government. However, by way of comparison, a brief overview of compensation / prevention programs available in provinces and / or states throughout Canada and the United States is provided. Information for this overview was obtained through correspondence with provincial and state agencies responsible for waterfowl management. A copy of the letter sent to the appropriate government departments is provided in Appendix A.[2]

A. Waterfowl Depredation and Control Measures in Canada

A summary of the information provided by Canadian provincial and territorial governments is given in Appendix A, Table 1. Of the ten replies, New Brunswick, Newfoundland, Nova Scotia and the North West Territories had little or no damage to agricultural crops. Government officials from the Yukon, Prince Edward Island and Quebec consider waterfowl to be highly localized yet minimal. Landowners in British Columbia suffer losses due to waterfowl depredations in several geographical areas. At present, the government of British Columbia provides advice and equipment to landowners. Issues of kill permits for ducks and geese are also provided in problem areas.

The most significant amount of waterfowl damage historically, takes place in the prairie provinces. The provincial governments of Alberta, Manitoba and Saskatchewan provide equipment and advice to landowners for preventative measures. In addition, bait stations and / or lure crop areas are maintained throughout the three prairie provinces. These practises reduce the amount of damage to agricultural crops.

Compensation programs exist in Alberta, Saskatchewan and Manitoba. Such programs are not available in any other province or territory. At present, compensation

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[2]See McConnell and Phillips (1983) for a more detailed discussion of Waterfowl Depredation and Control Measures in Canada and the United States.

programs in each province are cost shared on a 50 / 50 basis by the provincial and federal governments.

Each provincial / territorial government department responsible for waterfowl management is asked to comment on the relationship between crop depredation by waterfowl and waterfowl habitat loss. Of the six governments to respond to this question, those of British Columbia, Manitoba and Quebec suggested a correlation did exist. Prince Edward Island and Yukon Territory respondents did not believe a relationship was significant in their jurisdictions. Personnel in the province of Saskatchewan suggested any relationship between crop depredation and habitat loss was not known.

The agricultural communities appear to becoming less tolerant of waterfowl damage where it is significant. Government agencies are accepting some responsibility for agricultural losses. The degree of responsibility appears to be somewhat correlated with the extent of damage in the province. The precise relationship between crop depredation and habitat loss is unknown although several respondants have formulated opinions on this relationship. The suggested relationships vary depending on the severity of losses which take place in each province.

B. Waterfowl Depredation and Control Measures in The United States

Information provided by state departments in response to the letter shown in Appendix A is summarized in Appendix A, Table 2. All states with the exception of Hawaii were contacted. A reply was received from thirty-six states giving a response rate of 75 percent. These states are grouped according to the severity of the depredation problem as follows:

1: No Problem -	California Georgia Kentucky S. Carolina
2. No Information -	Minnesota; in the process of compiling data; none available at the present time.

3. Minimal damage -	Alabama	Idaho	New Hampshire
	Alaska	Kansas	Rhode Island
	Arizona	Louisianna	Texas
	Deleware	Maine	Vermont
	Florida	Montana	West Virginia
	Illinois	Nevada	
4. Significant damage -	Iowa	New Jersey	Oregon
	Maryland	New Mexico	Virginia
	Massachusetts	New York	Wisconsin
	Missouri	N. Carolina	Wyoming
	Nebraska	N. Dakota	

The extent of waterfowl depredation to agricultural crops throughout the United States varies significantly among states. Compensation programs are generally nonexistent. At present, Wyoming is the only state of those responding in which a compensation program exists. Prevention techniques vary and may include standard scare techniques, lure crops, bait stations and/or hunting pressures. Landowners appear to becoming less tolerant towards crop damage by waterfowl and wildlife in general. However, in some instances, landowners may be able to receive some income from hunters which may have altered their attutide toward waterfowl depredation.

C. Waterfowl Depredation and Control Measures in Alberta

Historical Perspective

Waterfowl depredation in Alberta has increased substantially in recent decades. The change from stooking to swathing of cereal grains during harvest has increased the availability of grain to migrating ducks particularly mallard and pintail species (Burgess, 1971). In response to increased depredation the provincial government introduced programs to alleviate losses suffered by the agricultural community.

In the period 1961 to 1963 an insurance program was initiated. Support for this program was derived from the sale of a mandatory wildlife certificate to provincial bird-game hunters. In 1964 the insurance program was terminated and a compensation program formed in its place. Landowners incurring depredation to crops by waterfowl could claim for damages to a maximum limit of $15/acre or one-half the value of the lost crop which ever is less. In 1966 the cost of wildlife certificates to hunters was increased to two dollars.

In 1970 the cost of a wildlife certificate was again increased by one dollar. An appraisal fee of $25 per section of land or portion thereof was charged to each claimant. At the same time, a prevention program in the Grande Prairie area using lure crops and a bait station was established. This program was considered efficient in reducing losses to crops in the area particularly with regards to the bait station approach. As a result, the program was continued in the same area on an experimental basis and later expanded into other areas of intensive damage as its effectiveness was proven.

In 1973 compensation to grain producers suffering damage and filing a claim for those damages was increased to a $25/acre maximum or 75 percent of the value of the lost crop, which ever is less. In the same year, federal and provincial governments agreed to cost share the compensation and prevention programs on a 50/50 basis. The agreement signed was retroactive to 1972 and although the initial agreement expired in 1976, sponsorship remains on a 50/50 cost sharing basis under new or updated forms of the original version.

In 1978 the limit on compensation available to landowners was increased to $50/acre or 75 percent of the value of lost crops which ever is less. Increases in the cost of wildlife certificates to bird game hunters occurred in 1981 and again in 1982. The resulting fees were five and six dollars respectively. However, revenue obtained from the sale of wildlife certificates in 1982 by private vendors was divided between the vendor and the damage fund. The vendor received one dollar for the sale of a wildlife certificate while the remaining five dollars was allotted to the wildlife damage fund. The certificates purchased from District Fish and Wildlife Offices contributed the total six dollar fee towards compensation disbursements for waterfowl damages to agricultural crops.

At present, the limit on compensation payouts available to landowners suffering waterfowl damage is a maximum of $50/acre or 75 percent of the value of crops lost which ever is less. Wildlife certificates sold to bird-game hunters in Alberta and throughout other provinces support the compensation program. Costs of wildlife certificates for hunters remain at figures quoted for 1982.

D. Analysis of the Compensation Program

The preceeding section provides a brief historical summary of the programs initiated by the government of Alberta in response to the waterfowl depredation problem. The main ingredient in the government's attempt to address this problem has been the compensation program established in 1964 under the provincial Games Act. This program has attempted to redistribute funds within society in order to alleviate some of the adverse affects of waterfowl depredation incident on affected landowners. The logic behind such an approach has already been discussed.

This section deals with an analysis of data accumulated by the Alberta Hail and Crop Insurance Corporation which administers the compensation program. Tables 3 to 12 which accompany this analysis are found in Appendix B. Information concerning the historical claims against the Wildlife Damage Fund and the compensation paid to claimants was provided by Alberta Fish and Wildlife for the years 1964 to 1981. Tables 3 and 4, Appendix B, summarize this information for each year from 1964 to 1981. The actual loss suffered by landowners initiating a claim for waterfowl damage is presented in Table 3, while compensation payments resulting from those claims are presented in Table 4. Claims and payments are recorded by township.

Two problems exist in the comparison of figures in the form presented in Table 3 and Table 4 given the details of the compensation program and the range of years over which the data is collected. Since its beginning in 1964 the Wildlife Damage Fund Act has been amended twice with regards to this compensation payment limitation. In 1973 and 1978 compensation to landowners suffering damage by waterfowl depredation was increased to a $25 and a $50 per acre maximum respectively. Consequently, a comparison of the data from 1964 to 1981 is biased due to the different limitations throughout the history of the program. In addition, values of crops per bushel used to estimate actual loss is also reflected in the compensation paid to landowners.

Table 5, Appendix B, displays an attempt to isolate the effects of the changing compensation payment limitations imposed throughout the programs history. Data are grouped according to years falling into the three payment per acre limitation categories. The years 1964 to 1972 are categorized by the $ 15 per acre limitation, 1973 to 1977 by the $25 per acre limitation and 1978 to 1981 by the $50 per acre limitation. A brief

examination reveals both the maximum compensation paid averages in column two increase from category 1 to category 2 and from category 2 to category 3. Similarly, the mean compensation paid values in column four increase when averages for each category are considered.

Application of the same analysis to actual loss values in column three and five shows increasing average values for maximum actual loss calculations from category 1 to catetory 2. However, a shift from category 2 to category 3 shows a decline in average maximum actual loss figures. A similar situation appears to develop when considering mean actual loss values for each year on a category basis. In this instance, the average for mean actual loss figures shows an increase from category 1 to category 2 but a decline from category 2 to category 3.

Further inspection of Table 5 reveals a general increase in prices used to value actual crop loss. In the years 1964 to 1972 average prices per bushel for all crops are significantly less than the average prices per bushel for the period 1973 to 1977. However, in the period 1978 to 1981 average prices per bushel declined from those in the period 1973 to 1977. Consequently, the increases in compensation paid over the period in which the compensation program has been in place is largely a result of both increasing crop prices and the increasing maximum limitation on compensation payments. Actual loss estimates appear to be directly correlated to the value of crops per bushel in each category.[3]

The second problem, that of inflation, is always present in comparing dollar values over time. In this instance, a dollar in 1964 is not comparable to a dollar in 1981. Nor is it comparable to a dollar in any other year in the time series given that the inflation rate was greater than zero in all years considered. Thus, some adjustments must be made in order to accurately compare information regarding the waterfowl compensation program.

In order to adjust each years' dollar values for comparison, some common denominator must be chosen. Table 6, Appendix B, shows the conversion factors chosen for each year to adjust all the years' dollar values to a common 1981 dollar value base. The 1981 dollar value base is chosen since it is easier to conceptualize in more

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[3]A comparison of the mean compensation paid values and the mean actual loss values using a weighted average approach to consider the varying sample sizes reveals similar results. These are shown in Appendix C.

contemporary terms. Figures in column 2 of Table 6 are the consumer price indices for all commodities provided by Statistics Canada. These figures are presented using 1971 as the base year for comparison. Thus, 78.6 cents in 1964 dollars equals one dollar in 1971. Similarly, $2.37 is required in 1981 to provide the same buying power as a dollar in 1971.

In order to convert the figures in column 2 to values reflecting 1981 as the base year in which all other years are compared, the following base-shifting calculations are necessary. For the year 1964, 78.6 / 236.9 = .33178; for the year 1981, 236.9 / 236.9 = 1.000. Thus, 33 cents in 1964 would have the same purchasing power as a dollar in 1981. Similarly, from Table 6, 53 cents in 1974 would have the same purchasing power as one dollar in 1981.

The adjustment of figures in Tables 3 and 4 in order to account for inflation requires that all dollar values be converted using the appropriate conversion factor (1981 base) provided in Table 6. The procedure is illustrated as follows. Considering the actual loss values in Table 3 for 1964, the maximum actual loss in column 3, $12,996, is divided by the conversion factor, .33178, in Table 6. The result is the value for maximum actual loss in 1981 dollar terms of $39,171 shown in Table 7, Appendix B. Similarly, for the maximum compensation paid value of $6,499 in Table 4 for the year 1964 the same conversion process results in a 1981 dollar value of $19,588 in Table 8, Appendix B.

Use of the dollar values portrayed in Tables 7 and 8 and organization of the years according to the compensation payment limits described earlier, results in the data provided in Table 9, Appendix B. Thus, Table 9 gives the same type of comparison as Table 5 except that all dollar values for all years 1964 to 1981 are now expressed in 1981 dollar terms.[4]

Where dollar values do not reflect inflation, compensations paid to landowners for crop damages due to waterfowl depredation increase from category 1 to category 2 and again from category 2 to category 3 (Table 5, Appendix B). This pattern is reflected in an increase in the average values of the mean compensation paid data. When inflationary pressures are considered and all dollar values are expressed in 1981 dollar terms, average values for mean compensation payments per category increase from category 1 to category 2 but show a slight decline from category 2 to category 3 (Table 9, Appendix B).

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[4]Appendix C provides a comparison of the mean compensation paid values and the mean actual loss values using a weighted average approach.

Thus, the increase in the limitations imposed on compensation paid per acre to landowners in 1978 may have not completely offset inflation during 1978 to 1981.

Average mean actual loss values per category increase from category 1 to category 2 but declined slightly from category 2 to category 3 in both Table 5 and Table 9. This pattern is expected when one considers the change in prices used to value crop losses shown in each table. In both instances average prices per bushel for all crops indicated show an increase from category 1 to category 2 and a decline from category 2 to category 3.

Another observation concerning the limitations on compensation payments arises when ratios between actual loss estimates and compensation paid are calculated. Actual loss / compensation paid ratios (AL / CP) by year from 1964 to 1981 ranges from a minimum of 0.18 in 1964 to a maximum of 107.47 in 1977 (Table 10, Appendix B). The mean actual loss / compensation paid ratio (AL / CP) ranges from 1.69 in 1964 to 5.84 in 1973. Standard deviation calculations for each year range from 0.43 in 1964 to 4.34 in 1974.

Reference is made again to the limitations of the compensation program outlined in 1964 and ammended in 1973 and 1978. In 1964 the compensation paid amount was calculated at the lesser of a maximum of $ 15 per acre or one-half the value of the crop destroyed or lost. Thus, during the period 1964 to 1972 the amount of compensation paid to any one claimant could not be more than one-half the actual loss. Similarly, under changes to the Wildlife Damage Fund Regulations in 1973 invoking a partial limitation of 75 percent of the value of destroyed or lost crops, the amount of compensation paid could not be more than 75 percent of the actual loss from 1973 to 1981. As a result, in the period 1964 to 1972 the actual loss / compensation paid ratio should not be less than two, nor less than 1.33 in the years 1972 to 1981. However, during the period 1964 to 1972, 380 townwhips received compensation greater than 50 percent of the actual loss estimates (Table 10, Appendix B). Of these 380 observations, 366 occurred in 1964. In the period 1973 to 1981, 39 townships received compensation in amounts greater than 75 percent of the value of crops destroyed or lost. Although these comparisons are based on township data, actual loss / compensation paid ratios (AL / CP) for individual claimants within a specific township are reflected by the overall township AL / CP ratio.

The results may appear inconsistent with details outlined in the Wildlife Damage Fund Regulations. However the inconsistency may be more apparent than real. For example, landowners whose crops are situated within a specified distance from lure crops or bait stations utilized for depredation prevention may be entitled to receive up to the full amount of the value of crops lost or destroyed. (This provision would only be valid for years after the initiation of the lure crop / bait station program in 1970). Due to the wide range in the actual loss / compensation paid ratios it is conceivable that attitudes of landowners towards the compensation program may vary, especially among landowners who are constantly at the extremes. In addition, attitudes toward waterfowl habitat may vary as a result of the variation in the actual loss / compensation paid ratios. Previously described opinions by provincial and state department personnel suggest that a correlation between waterfowl depredation and habitat loss may exist. In such instances, if landowners suffering waterfowl damage do not regard compensation as adequate, consistent and / or equitable, habitat removal may take place.

The relationship between crop damage compensation paid and actual loss can be expressed in terms of correlation and regression. In terms of the regression analysis, compensation paid (y) is specified as a linear function of actual loss (x) (i.e., $y=a+bx$). The number of observations (townships), constant or intercept term (a), slope coefficient (b), and standard error of the slope coefficient are provided for each year 1964 through 1981 (Table 11, Appendix B). The regression results are highly significant statistically as indicated by the very low standard errors of the slope coefficients and exceedingly high F-statistics values. The correlations between compensation and loss range between 0.94 and 0.99 suggesting a near perfect positive association. Between 88.81 percent and 97.34 percent of the variation in compensation paid is explained by the variation in actual loss by townships for the years 1964-81. However the standard errors of the estimate of compensation paid show considerable variation. These standard errors are approximately 25 to 40 percent of the mean values of compensation paid over the years considered, thus confirming some inconsistency between actual loss and compensation paid.

Finally, townships can be grouped according to the number of years in which claims for compensation were filed from 1964 to 1981 (Table 12, Appendix B).[5]

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[5]Values in Table 12 are in 1981 dollars. Townships are grouped according to the number of years in which claims for compensation was filed from 1964 to

Townships are grouped according to the number of years in which claims for compensation were filed from 1964 to 1981. Only one township showed claimes for each of the eighteen years during this period. Although the frequency of damage in this township was high, the compensation paid reflected only 0.3 percent of the total compensation payments. At the other extreme, compensation was paid only once to individuals in 483 of the total 2105 townships during the period 1964 to 1981. The total compensation for this group of townships amounted to $596,276 or 2.86 percent of the total compensation paid. On average 117 townships appeared in each frequency grouping.

In the period 1964 to 1981 a total of $20,483,623 (1981 dollars) was paid in compensation to landowners incurring waterfowl damage. Of this total amount 23.81 percent was paid to landowners in townships claiming up to five of the 18 years, 65.21 percent to landowners in townships claiming up to 10 of the 18 years, and 94.1 percent to landowners in townships claiming up to 15 of the 18 years. The highest amount paid was for the frequency grouping six of 18 years in which landowners received $1,888,130 or 9.05 percent of the total compensation paid. Conversely, the lowest paid frequency grouping was 18 of 18 years receiving $64,113 or 0.31 percent of the total compensation paid in 1981 dollars.

E. Analysis of Water Project Applications Under the Alberta Water Resources Act

Information concerning applications for use or diversion of the water resources in Alberta is provided by the Alberta Water Resources Management Division. Individuals or groups who wish to use or divert water available on either public or private lands in Alberta must apply to the Water Resources Management Division for approval as outlined in the Water Resources Act. Applications made under the Water Resources Act in Alberta have been documented since the late 1800's. However, only those applications made during the period 1964 to 1981 are considered in the report in order to make a comparison with the compensation program for waterfowl depredation.

Applications to the Water Resources Management Division are recorded by the year of application, applicant name, source of water supply and the stated purpose of the application. For the purposes of this report applicant names are grouped into categories

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[5](cont'd) 1981.

described as either private company, government, or private individual. An additional category is added specifically for those applications made by Ducks Unlimited (Canada). In addition, only those applications having a stated purpose described as either diversion, storage or other are considered. These categories are important since the report is concerned with the possible influence of the compensation program on waterfowl habitat or conversely, the effect of water use on waterfowl depredation. The remaining categories such as domestic or industrial use of water are not considered appropriate for this analysis. The source of water supply is recorded as in the original information provided by the Department of Water Resources. The terms applications and project are used synonymously throughout this section of the thesis.

Once formal applications have been made to the Water Resources Management Division they are generally approved. However, situations may arise in which applications for water use do not result in actual project development. Applications receiving approval may not go ahead immediately due to a change in requirements by the individual or group concerned. Similarly, projects which have been approved and completed may be cancelled as requirements for water use change. During the period 1964 to 1981 approximately 10 percent of the applications recorded were cancelled under such circumstances. Tables 13-20 inclusive in Appendix D accompany the analysis of water project applications in Alberta.

The number of applications made under the Water Resources Act vary from 22 in 1965 representing 1.7 percent of the total applications to 163 applications in 1981 or 12.8 percent of the total (Table 13, Appendix B). From this analysis, it is evident the number of applications designated storage, diversion or other in the province has been increasing since 1974. Applications during years 1964 to 1974 made up slightly more than 35 percent of the total, whereas those documented during the period 1975 to 1981 contributed 64.7 percent to the total. Individuals or groups in 501 townships in Alberta applied once to the Water Resources Management Division under the Water Resources Act during the period 1964 to 1981 (Table 14, Appendix B). Similarly, individuals or groups in one township made sixteen applications for water use described as diversion, storage or other during the period 1964 to 1981. These two township groupings describe the extreme cases concerning the frequency of applications. Ninety-five percent

of all townships in which individuals or groups applied for water permits in Alberta made fewer than four applications.

During the eighteen year period a total of 1277 applications were made. Of this total, 842 or 66 percent showed the stated purpose as diversion (Table 15, Appendix B). Applications showing the stated purpose as storage contributed 23 percent of the total number of applications. Thus, in the period 1964 to 1981 diversion projects contributed almost three times more to the number of total applications than did storage applications received by the Water Resources Management Division.

Applications can be grouped according to the general applicant name (Table 16, Appendix B) or by the source of water supply (Table 17, Appendix B). Those applications registered under Ducks Unlimited (Canada) amount to 281 or 22 percent of the total applications. Since Ducks Unlimited (Canada) is an organization dedicated to the maintainance of suitable waterfowl habitat, they are not generally engaged in diversion projects. In fact, the major portion of diversion projects are conducted by governments whether municipalities, urban communities or provincial departments (Table 18, Appendix B). Diversion projects by private individuals amount to 229 of the total 842 diversion applications documented during the period 1964 to 1981. The major portion of these diversion projects by private individuals have occurred since 1975.

The major applicant promoting storage or other projects during the period 1964 to 1981 was Ducks Unlimited (Canada) (Tables 19 and 20, Appendix B). These results are somewhat confusing since many Ducks Unlimited (Canada) projects provide benefits not directly attributable to waterfowl production. In many instances, especially in Southern Alberta, primary benefits from Ducks Unlimited (Canada) water storage projects accrue to individual landowners and/or municipalities.

The results and analysis provided here are limited. Unfortunately there is no ready means of determining the actual size of each project from the information provided. Furthermore there is no method of ascertaining the quality or quantity of waterfowl habitat either created or destroyed under these project classifications. Several criteria are apparent when determining the amount of waterfowl habitat provided in any area. Nesting cover, shoreline patterns and food sources are but a few of the criteria to be considered. As a result, information presented in this thesis is inadequate to define specific

correlations between water resource projects and waterfowl depredation in Alberta. However, this analysis in conjunction with work by Goodman and Pryor (1971) suggest waterfowl habitat is declining in Alberta.

F. Summary

Land available for providing waterfowl habitat is declining significantly in Alberta. This development is, however, not peculiar to Alberta. Land use pressures from the agricultural sector throughout Canada and the U.S. have reduced land available for waterfowl habitat. Landowners faced with increasing production costs and changing farming techniques are continually interested in increased productivity from all land within their operation.

Crop damage due to waterfowl depredation reduces the revenue to affected landowners. In the absence of adequate compensation landowners may attempt to reduce the effect of crop depredation. Inadequate compensation may result in partial or complete removal of waterfowl habitat. When such alterations are not possible a negative attitude on the part of landowners toward waterfowl may result.

The province of Alberta has initiated both compensation and prevention programs to counteract the effect of waterfowl depredation. However, the decline in waterfowl habitat on private lands is dependent on individual landowners. The previous analysis of the present compensation program in Alberta indicates a wide range in the extent of compensation to individual landowners. The range in compensation may affect attitudes on the part of landowners toward waterfowl. Similarly, the amount of lost crop that is not compensated may affect landowner attitudes toward retaining waterfowl habitat to some extent.

This thesis analyzes the possible effect of the compensation program in retaining waterfowl habitat on private land in Alberta. Should such a relationship exist, alterations in the present program to slow the decline in waterfowl habitat may be both desirable and possible. The benefits and costs of any alteration must be determined prior to actual changes. Nonetheless, any realistic means of retaining waterfowl habitat for future generations is an objective worthy of consideration. The following chapter outlines the conceptual framework surrounding the waterfowl depredation / waterfowl habitat

controversy. A review of the basic concepts contained in the framework will shed some light on potential solutions to the issues raised in this thesis.

III. CONCEPTUAL FRAMEWORK

In the early 1900's land in Alberta was plentiful relative to social demands for land use. Conflicting land use demands were not a primary social concern. As a result, public decisions regarding the use of land [illegible] social demands were largely single use-oriented. However, demands incident on the land base have increased with Alberta's growing population. The growing demand for land resource goods and services has led to increasing land scarcity.

Resource scarcity is a fundamental issue underlying the study of economics. Scarcity arises when a particular resource does not exist in sufficient quantities to satisfy human wants at prices greater than zero. The notion of scarcity implies the need to choose between alternative resource use patterns. As mentioned previously, much of the land base in the Prairie and Parkland regions of Alberta contributes significantly to agriculture, recreation and wildlife production. Land allocation decisions in this area have favored agricultural production in the past. However, in recent years growing demands for recreational services and concerns over wildlife populations have influenced land use decisions. In many instances, choices between alternative land use practices have required the initiation of multiple land use planning strategies.

Economic analysis can be used to analyze situations where alternatives to resource use are possible. The main focus of this approach is to evaluate alternative resource use patterns and determine which alternative will produce the maximum social net benefits. Two main criteria should be addressed as an economic evaluation of resource use pattern alternatives.

These criteria are as follows:

1. Economic efficiency - This criteria deals with attaining the greatest net value or net benefit to society from resource use patterns. No resource use pattern alternative would be selected if the costs of such an alternative outweighed the benefits. Similarly, the economic efficiency criteria would disallow any resource use pattern if an alternative provided greater net benefits to society. All benefits and costs whether tangible or intangible must be included in the analysis. However, the incidence of benefits and costs to individual members or groups within society is not considered.

2. Equity - The equity criteria is concerned with the distribution of benefits and costs within society as a result of a particular resource use strategy. Equity concerns involve both tangible and intangible considerations. For example, income distribution and cultural impacts may be considered tangible and intangible issues respectively.

The concepts of economic efficiency and equity are not necessarily compatable. Often the most efficient resource use pattern may not present an equitable distribution of benefits and costs within society. Issues related to efficiency criteria can be analyzed precisely whereas equity considerations are largely subjective and equity decisions require collective action. Equitable distributions of benefits and costs resulting from resource use patterns are no more easily analyzed by economists than any other group within society. Given the difficulties in accessing the contribution of various equity arrangements, economic theory tends to emphasize efficiency considerations. However, the application of economic principles can provide useful information for public policy decisions.

A public decision-making approach to access alternative resource use patterns is found in production economic theory. The basic approach, in its simplest form, deals with the production of two or more outputs using one variable input. This approach may be modified to allow an analysis of situations in which a fixed resource must be allocated among two or more alternative use patterns. This approach requires technical information regarding the physical capabilities of resource use alternatives to produce goods and services. In addition, a method for society to value all goods and services produced relative to one another is required.

If efficiency is an important goal, public decision makers can adopt the economic principles illustrated with the use of a production possibilities curve and an iso revenue line (figure 4). The curved line AB represents the combination of outputs Y1 and Y2 that can be produced given the current technology and a fixed amount of the resource input. The points along this curve are produced with the resource allocated among various combinations of resource use patterns producing Y1 and Y2. The line CD represents the relative values society places on the production of the goods and services Y1 and Y2. Any point within the area AOB is attainable given the present technological capabilities of production and the limited quantity of the resource. Conversely, points outside the boundary indicated by the curve AB are unattainable given present technology. Points along

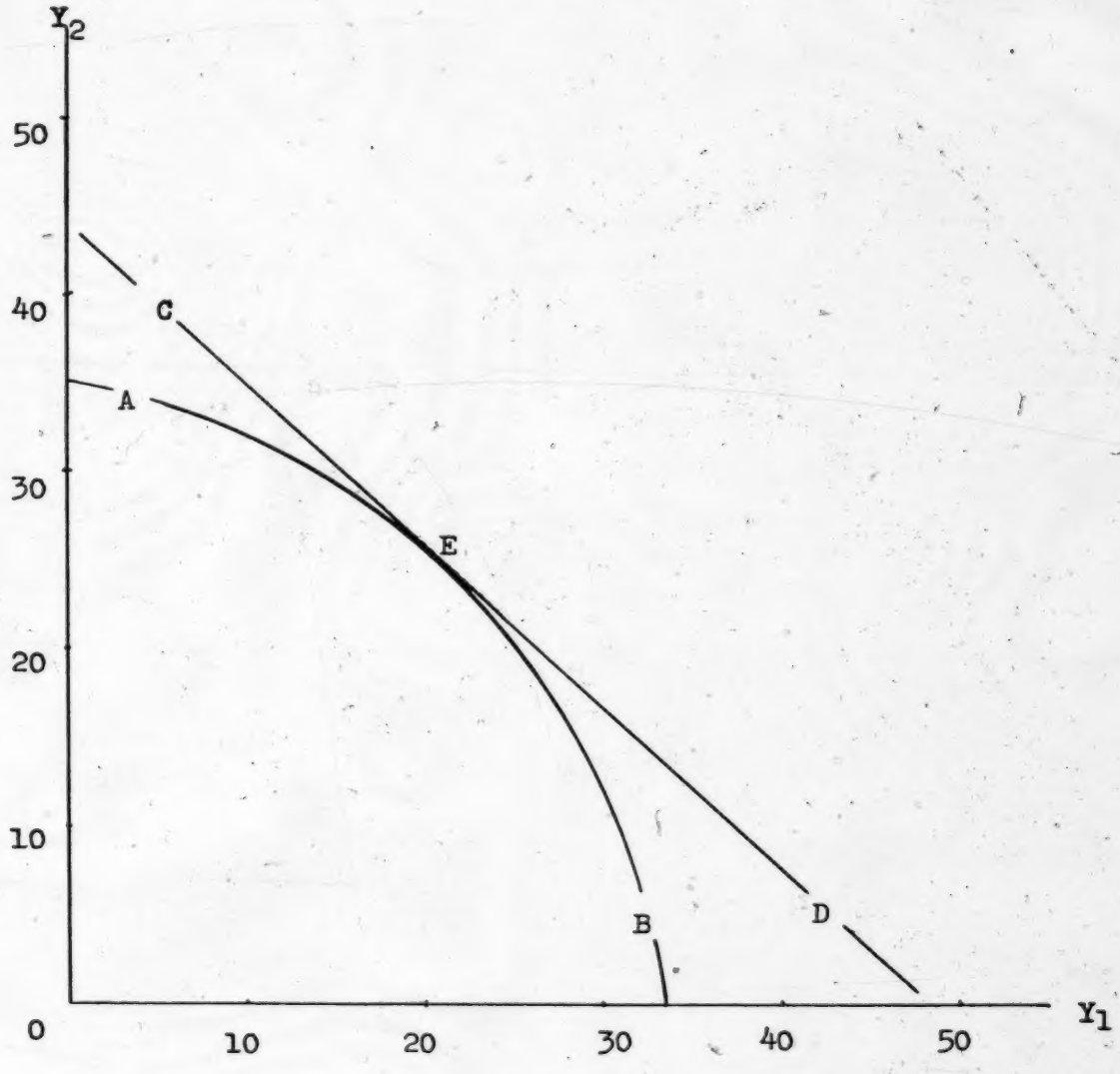

Figure 4. Selecting Between Alternative Resource Use Strategies

the line AB represent the most efficient use of the available resource. Since economic efficiency is a desired goal, the point representing the allocation of the resources among Y1 and Y2 will lie along the line AB. (Notice this approach does not consider the equity criteria). The point of maximum social net benefit is defined as the point E where the line CD is tangent to the curve AB.

It is important to note that changes in technology and societies value of goods and services will affect the allocation of resource use among production processes for Y1 and Y2. Advances in technology would shift the curve AB outward from the origin. The shape of the curve would change if technological advances in one production process improved relative to the other. Changes in the relative value of goods and services Y1 and Y2 would alter the slope of line CD. Any alteration in technology or relative values of the outputs would require a reaccessment of resource use strategies.

Pearce (1969) expands this basic production economics model to encompass situations requiring multiple land use decision. Primary and secondary land use alternatives are identified. When alternatives conflict, land devoted to the secondary use is increased as long as the net benefits received are greater than the net benefits that could have been achieved using the primary alternative. The adjustment continues until the last increment of land applied to the secondary use produces net benefits just equal to net benefits otherwise produced by the primary alternative. Further allotment of the resource to the secondary alternative will result in an overall decrease in net benefits attainable from the resource. Given an accurate accessment of benefits and costs, the end result corresponds to position E in Figure 4. The approach may be expanded further to include situations where more than two conflicting resource use patterns are concerned. However, the objective of any resource use strategy must be to leave as many future options open in the event societies valuation of goods and services should change. Any resource use strategy which locks the future use of a resource into a set pattern should be avoided if possible.

The problems concerning available waterfowl habitat in Alberta may be considered using this theoretical approach. The analysis could be used to choose among alternative combinations of land use among all competing uses. However, agricultural production exerts the greatest influence on waterfowl habitat availability in Alberta. In such instances,

a measure of the social value for agricultural products and waterfowl is required. Prices for agricultural commodities are readily determined from market transactions although many values are distorted by government intervention. Production functions for agricultural production are also readily determined. Consequently, the value from agriculture to individual producers and to society as a whole can be estimated directly.

Factors required to produce waterfowl habitat are known with certainty. Contributions of specific habitat areas to waterfowl production throughout the flyway are known to some degree. However, a market value or price for waterfowl is not so readily available. Several authors have developed techniques to access demands for wildlife and thereby suggest extra-market values for various wildlife species. These extra-market values can be incorporated into analysis using evaluation criteria to compare alternative resource use patterns. Significant progress in the valuation of extra-market values has been made.[6] However, the best estimates produce differing values depending on the technique applied.

Two basic perspectives must be considered when accessing the contribution of private land in Alberta to either agriculture or wildlife production. These perspectives are as follows:

1. Societies view of general land allocation by region with respect to agriculture and wildlife productivity, and
2. The individual landowner's view of land allocation within his/her farm operation.

Public land use decisions are concerned with attaining the best use of all lands for society in general. However, in Alberta much of the prime waterfowl producing areas are

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[6]Techniques for estimating market values for wildlife species and recreational services are grouped according to direct or indirect approaches. Using the direct approach, extra-market values are estimated under hypothetical market situations. Willingness to pay for a good or service is contrasted with willingness to accept compensation to forgo the benefits derived from a good or service. In these situations, a range of values results with willingness to accept compensation generally greater than values reflecting willingness to pay. Examples of this method include works by Hammack and Brown, 1974; Phillips et al, 1978; Phillips and Carroll, 1978; and Gordon and Knetsch, 1979.

The indirect approach derives extra-market values from expenditures required to obtain wildlife or recreation related experiences. The travel cost method derives demand schedules for the price of recreational days from travel expenditure information (See Clawson, 1959). In comparison, the hedonic method expresses recreation expenditures as a function of recreational days and wildlife captured. Varying expenditures allow the estimation of values for an additional days recreation or the successful capture of additional wildlife. (See Adamwicz and Phillips, 1983).

situated on privately held lands. In these instances, decisions regarding the distribution of lands among alternative uses are made by individual landowners. Theoretically, a landowner's decision making process regarding land use is similar to that illustrated in Figure 4. However, the incidence of benefits and costs on landowners regarding waterfowl may not be identical to those incurred by other members in society.

Landowners incur a major portion of habitat provision costs on private lands. Cost to the landowner from reduced productivity, weed control and lost time due to circumnavigating these areas during cropping practices are readily derived (Apedaile and Rapp, 1983). In addition, losses in revenue due to waterfowl production can be quantified. Conversely, benefits to landowners from waterfowl or waterfowl habitat are not easily determined. The close proximity of waterfowl species and habitat areas may not provide benefits which outweigh provision costs. In addition, present economic conditions exert pressures on landowners to increase productivity. As a result, land suitable for waterfowl may be altered to gain greater benefits from agriculture. Individual alterations may not appear significant. However, the overall land use patterns developing on privately held lands may not be desirable from a social perspective. Some form of collective action may be required to redistribute social benefits and costs should a deviation from the overall social objective exist. Such action may be required to reallocate land among competing uses. Programs developed in this regard are concerned with gaining increased efficiency from a social perspective. A redistribution of benefits and costs may act through a market or taxation system to influence individual landowner decisions regarding land use. Similar action may be taken to redistribute benefits and costs among members of society due to equity issues. However, programs developed in this sense may not necessarily be intended to influence the distribution of land among competing uses.

The compensation program for waterfowl depredation in Alberta is a form of collective action. Government agencies in conjunction with hunter associations have created a fund to alleviate landowner losses due to waterfowl depredations. However, the effect of the compensation program on the availability of waterfowl habitat is not known. Nonetheless, the compensation program acts to redistribute the costs of waterfowl production among members of society. In this sense, the program is concerned with an equitable distribution of social benefits and costs. This thesis examines the role of the

compensation program in retaining waterfowl habitat. Results from this analysis may provide insight to the performance of the compensation program regarding both efficiency and equity criteria.

Collective action to develop maximum social net benefits from the use of resources is generally required due to the specification of property rights within society. Property rights define a structure of ownership and shape the incidence of benefits and costs from resource use patterns within society. The property rights structure is reflected in legislation, customs and attitudes pertaining to resource use. Property rights govern the extent to which individuals may use certain resources by specifying limitations on use patterns. Demsetz (1967) states,

> "Property rights are an instrument of society and derive their significance from the fact that they help a man form expectations which he can reasonably hold in his dealing with others."

Thus, property rights are designed to regulate interactions among individuals within society. However, the specification of property rights depend to a large extent on the basic philosophy or ideologies present within society regarding the use of resources.

In a society where rights to use resources are assigned to individuals or groups, conflicting interests are bound to arise. The actions of individual resource use patterns may affect the welfare of other individuals. The development of these situations is referred to as an externality.[7] Externalities only exist when an individual considers his/her welfare to be affected. Negotiations between acting and affected parties may or may not result. The nature and extent of any negotiation is influenced by the cost of negotiations and the liability rules which exist.

Liability rules are closely related to the property rights structure. Liability rules describe the rights which individuals possess and determine the responsibility for individual/group actions in dealings with others. Bromley (1978) examines several possible liability situations or entitlements following Calebrasi and Melamed (1972). Major differences in entitlements arise depending on which of the parties involved is liable. The classification of entitlements presented by Bromley is reproduced in Table 3.1.

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[7]Buchanan and Stubblebine (1962) attempt to clarify the notion of an externality. Six specific classes of externalities are identified depending on the nature of the interaction between the acting and affected party.

Rule I (property rule)	A *may not* interfere with B without B's consent; B is protected by a property rule.
Rule II (liability rule)	A *may* interfere with B but must compensate; B is protected by a liability rule.
Rule III (property rule)	A *may* interfere with B and can only be stopped if B buys off A; A is protected by a property rule.
Rule IV (liability rule)	B *may stop* A from interfering but must compensate A; A is protected by a liability rule.
Rule V (inalienability rule)	A *may not* interfere with B under any circumstances, and the stopping does not imply compensation; B is protected by inalienability.

Table 3.1. Alternative Rules of Entitlement

Adapted from Bromley (1978)

In Canada, control of the waterfowl resource is under the jurisdiction of the federal government although ownership is not clearly defined. The waterfowl resource is assumed to be the property of all Canadians. Federal and provincial governments combine to manage the resource as stewards representing the public interest. Regulations pertaining to hunting activities are set by the federal government. Individuals who successfully capture waterfowl by hunting are the only consumers who may legally claim ownership on an individual basis. Ownership of waterfowl in this regard does not include the right to sell the resource once captured. Governments have regulated the extent to which landowners can prevent losses due to waterfowl depredation. Wildlife sanctuaries are included in federal and provincial waterfowl management plans. Waterfowl using these areas may inflict damages to agricultural crops owned by private individuals.

The property rights structure regarding waterfowl and land results in the development of several externalities. Waterfowl, by nature, feed on agricultural crop during their migration patterns. The extent of the depredation is largely due to weather conditions at the time of migration. However, the welfare of individual landowners is affected as a result of foregone revenue from agricultural crops. The existence of compensation programs to alleviate losses is evidence that losses are significant to landowners. Much of Alberta's primary waterfowl nesting areas is situated on private lands. Decisions regarding the use of private lands are generally made by individual

landowners. However, decisions by landowners which are in their best interest may affect the welfare of other individuals or society as a whole. Increasing agricultural production at the expense of waterfowl habitat may not meet with societies overall objectives. Reductions in waterfowl habitat or action to reduce waterfowl depredation by individual landowners may increase the damages to another individual's crops. Such actions would reduce the welfare of the second individual. Similarly, consumptive use of the waterfowl resource by hunters may reduce the level of waterfowl available for non-consumptive activities. This effect may be minimal. However, as waterfowl populations become depleted due to natural causes hunting mortality will have an increased effect.

The property rights structures and externality situations which exist concerning issues related to waterfowl habitat in Alberta are readily defined. However, the nature of liability rules developed to determine responsibility for externality situations is more complicated. Prior to the 1960's no program to compensate landowners for losses due to waterfowl depredation existed. With the advent of an insurance program in 1961 and the Wildlife Damage Fund in 1964 governments and hunters accepted some liability for crop losses. However, since governments regulate the amount of compensation to be paid, the extent of liability acceptance is not clear.

In short, issues concerning the availability of waterfowl habitat in Alberta arise due to the specification of property rights. Waterfowl species are a public resource whereas much of the primary nesting grounds are situated on private lands. Ownership of waterfowl is not clearly defined. No market exists in which an accurate value for waterfowl can be derived. Landowners may not receive monetary rewards from the sale of waterfowl. Thus, although many landowners incur costs due to waterfowl and/or waterfowl habitat, direct remunerations are not forthcoming. In this instance, the property rights specifiction leads to what is described as an inbalanced situation. Ciriacy-Wantrup (1968) suggests an imbalance of property rights is one which leads to

> "such a distribution of revenues and costs from resource utilization among the members of a social group that the agent responsible for conservation decisions is not interested in taking all the revenues and costs into account."

Landowners incurring costs from waterfowl production greater than the benefits they receive may not consider the losses to society in general, from reduced waterfowl habitat when making land use decisions. As a result, the imbalance of property rights

situations may result in land use patterns which do not reflect societies overall interests.[3]

Situations are conceivable in which markets could be developed for the waterfowl resource. Licenses to hunt or maintain waterfowl could be traded in an open market. However, the necessary property rights changes to allow such a market to develop may conflict with the attitudes and ideological principles of many individuals within society. Consequently, the costs which result from such property rights changes may be greater than the benefits realized.

Externalities arise due to the property rights specifications regarding waterfowl and agricultural land in Alberta. Management and protection of the public waterfowl resource result in situations where individual landowners suffer reduced revenues. Collective action is required to alleviate these externalities in the absence of a market structure for waterfowl. The compensation program for waterfowl depredation is a form of collective action intended primarily as a means of redistributing the costs of waterfowl production. However, the effect of the compensation program in land allocation decisions is not completely understood.

The following chapter outlines the technique employed to access the effect of the present waterfowl compensation program on landowners land use decisions. Chapter V presents the results of information gathered from individual landowners. An analysis of this data should provide some insight into landowners opinions regarding the use of private lands by waterfowl species and hunter groups. In addition, results of this thesis should provide a better understanding as to the role of the waterfowl compensation program in meeting the efficiency and equity criteria discussed above.

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[3]Other imbalances in the present property rights specifications may also exist. For example, benefits to hunters throughout the flyway system may outweigh their portion of waterfowl production costs. Although these various structures are intertwined this thesis concentrates on the benefits and costs incidente on landowners due to waterfowl production. See Ciriacy-Wantrup (1968) for a detailed summary of problems inherent in property rights specification.

IV. SAMPLE DESIGN

Information was obtained from individual landowners within selected townships throughout Alberta using a random sampling technique. Townships selected for this analysis were chosen from an initial population size of 2105 townships. The initial sample was obtained from Alberta Hail and Crop Insurance data outlined in chapter 2. Each township may only be included once within the initial population regardless of the number of individuals within its boundaries receiving compensation. The inclusion of any township requires that at least one landowner within the township boundary had applied for compensation from the Alberta Hail and Crop Insurance Corporation for wildlife damages during 1964 to 1981. The Alberta Hail and Crop Insurance Corporation has made compensation payments for several types of wildlife damage. However, the vast majority deal with payments for waterfowl damage to grain crops.

Thirty townships were selected from the initial sample universe of 2105 using a series of computer generated random numbers. Figure 5 shows the geographical distribution of these townships throughout Alberta. The 30 townships selected were subdivided into quarter sections (160 acre parcels). Alberta Hail and Crop Insurance data for wildlife damages are tabulated according to quarter sections of land. Thus, subdividing the selected townships into quarter section parcels allows information to be collected from individual landowners.

Names of individual landowners within selected townships were obtained from county, municipal district and improvement district maps. The most recent map publications were gathered from several sources. These sources include:

1. Municipal Affair's Branch, Alberta Provincial Government
2. Map Collection, University of Alberta
3. County and Improvement District Offices throughout Alberta.

Table 23, Appendix D, shows the year and description of the most recent map publication, by township, used to select landowners.

In order to select landowners randomly, quarter sections within each township were identified numerically. Numbering began in the south-east quarter section of each township. The procedure continued until all 144 quarter sections in each township were assigned a numerical order, as illustrated in Figure 6, Appendix D. In addition, each of the

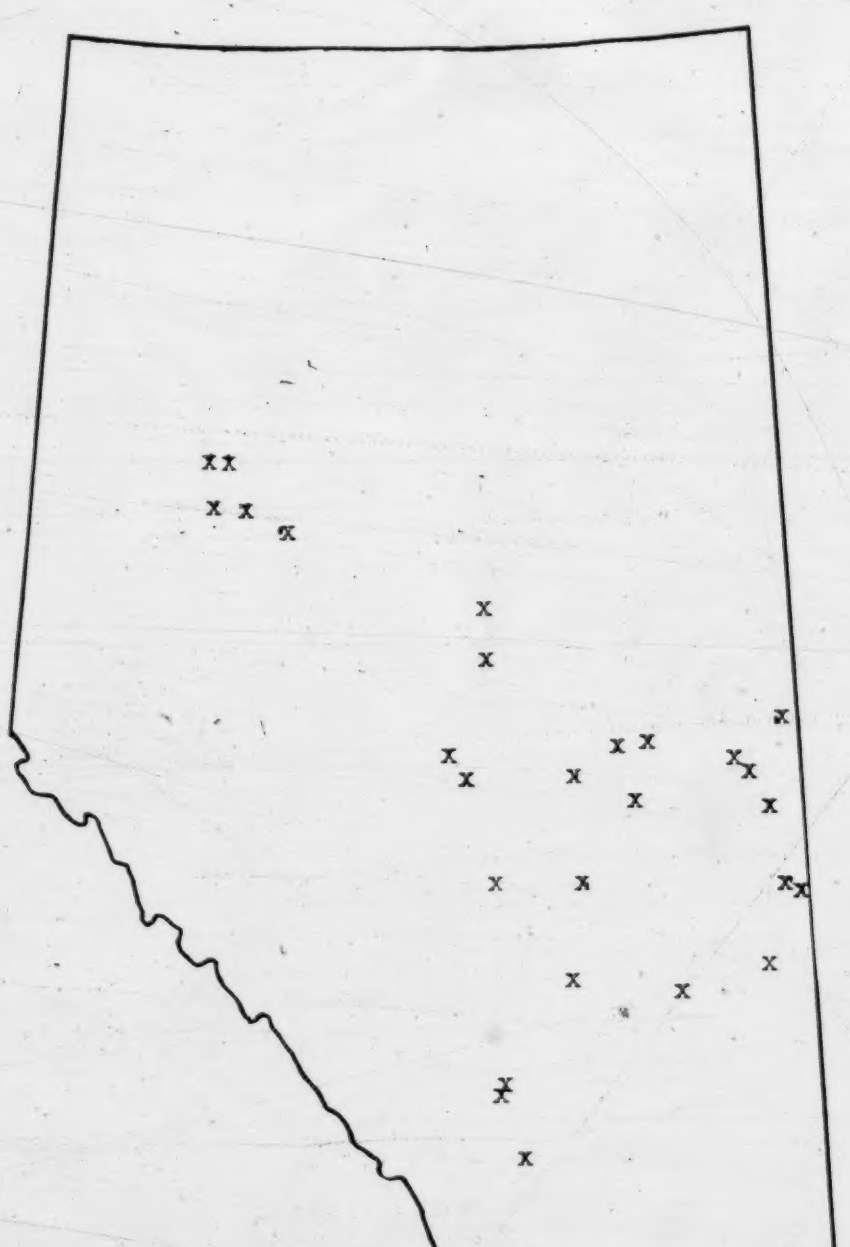

Figure 5. Spatial Distribution of Townships Selected at Random Throughout Alberta for Landowner Survey

144 quarter-sections in each township was assigned the corresponding landowner name from county and/or district maps. In several instances, certain quarter sections were not privately owned and, consequently, were not included in the selection process.

Following the assignment of numbers and landowner names, quarter sections were divided into two categories. Categories were determined by the past history of wildlife damages in each quarter section. The first category includes all quarter sections indicated on claims processed by the Alberta Hail and Crop Insurance Corporation from 1964 to 1981. The second category includes all remaining quarter sections except those owned by landowners appearing in the first category. Using this procedure, each landowner group is mutually exclusive. Exclusivity between landowner groups is important since it may be difficult for landowners to express an opinion regarding the effect of wildlife damages on land use decisions at the quarter-section level.

Landowners are chosen randomly from each category on a township basis. A series of computer generated random numbers was produced for each township. The random numbers selected from each township vary since the number of landowners within each township varies. In general, farms in the southern part of Alberta are larger than in northern townships. Landowners, corresponding to the computer generated random numbers, were contacted by phone. Each landowner contacted was informed of the general nature of the project. Only landowners wishing to participate were included in the survey. In addition to receiving a mail-out survey, 15 landowners were contacted for direct interviews. The interviews were conducted to verify results of the mail-out survey. The random solicitation for participants continued, as time allowed, until representatives from each of the two categories in the 30 townships were obtained. Approximately 215 individuals were contacted by phone during the period November 28th to December 4th, 1983. Of the total number of landowners contacted, 192 individuals agreed to participate in the survey. Table 24, in Appendix D, shows the number of individuals by category in each township agreeing to participate.

Survey packages were sent by mail to consenting landowners on December 5th, 6th and 7th, 1983. The survey package contained:

1. a personally addressed cover letter,
2. a questionnaire entitled "Private Land Wildlife Use Survey, and

3. a stamped, addressed return envelope.

A copy of the cover letter and questionnaire is provided in Appendix E.

The questionnaire sent to consenting landowners is designed to obtain information to fulfill two objectives outlined in the introduction. These objectives are as follows:

1. to identify the extent to which land use changes have altered waterfowl habitat availability among landowners suffering waterfowl depredation throughout the province, and
2. to identify the role of the compensation program in land use changes altering waterfowl habitat in Alberta.

In order to fulfill these objectives landowners incurring waterfowl depredation are asked to define land use changes directly attributable to waterfowl depredations. In addition, some means of comparing landowners decisions regarding waterfowl habitat retention is required. Landowners affected by waterfowl depredation but not requesting compensation are contrasted with those receiving compensation. In this manner any significant effect of the compensation program on landowner decisions regarding waterfowl habitat would be evident.

Due to time limitations and budgetary constraints townships were selected to include landowners from each of the two categories previously mentioned. In addition, this procedure allows fewer discrepancies in farm practices due to spatial variation. Consequently, differences in landowner attitudes between categories is more likely to occur solely as a result of the compensation program.

The questionnaire was designed to gather information regarding several factors which may affect landowner attitudes towards wildlife and the retention of wildlife habitat. Using this format, attitudes related specifically to waterfowl issues may be extracted from the overall results. However, the general format also allows a comparison of waterfowl related issues to landowner concerns regarding other wildlife species. Structuring the questionnaire in this manner would not encourage landowners to exaggerate their positions regarding waterfowl relative to other wildlife issues. However, expanding the questionnaire to include concerns of landowners other than wildlife issues would be overly cumbersome.

Landowners are asked to describe areas within their farm boundary which they consider suitable for wildlife habitat. Only areas considered suitable for habitat would conscientously be altered due to damages from wildlife. A scale was used to allow landowners to describe the amount of wildlife existing on their land. Questions regarding past experiences with wildlife depredations and programs offering assistance to alleviate these problems are asked. The nature and extent of past damages may affect landowner decisions regarding habitat retention and opinions of existing programs. In addition, landowner awareness of assistance programs may affect the role such programs play in habitat retention.

A significant portion of the questionnaire was designed to obtain information regarding alterations to the farm operation and/or wildlife habitat areas. Estimates of costs incured by landowners for these alterations is requested. The extent to which landowners take action to reduce damages may be a reflection of the severity of damages and/or inadequate assistance programs.

The fourth section of the questionnaire deals specifically with landowner opinions regarding compensation for wildlife damages. Information regarding an acceptable level of compensation for damages can be used to compare with similar results obtained in future surveys from other interested parties. This section provides landowners with an opportunity to indicate contributor sources for compensation programs and opinions regarding the calculation of compensation payments. Information regarding future plans by landowners to alter habitat and/or farm operations due to wildlife depredations is sought in this section.

The last section of this questionnaire deals with information regarding hunting activity. Each landowner is asked to comment on their personal hunting activities. Landowner attitudes towards wildlife or wildlife habitat are likely to be affected to some extent by personal hunting activities. Landowners are asked to comment on the courtesy of hunters to whom they have been exposed. This information was requested since funds for present waterfowl compensation programs are generated in part by hunting licences. Part of the reasoning for hunter involvement in the compensation program is to establish better hunter-landowner relations. An analysis of the results of this particular section may provide insight into the effectiveness of the compensation program in this secondary role.

Using a mail out questionnaire to obtain information is a relatively simple and efficient method. However, potential limitations do exist. The timing involved in mailing the survey package to participants presents some problems. An attempt was made to avoid the Christmas mailing season by sending survey packages to participants in early December. However, three of 15 landowners contacted for interviews had not received the survey package two weeks after mailing.

The technique described to select individual landowners may bias the results to some extent. Only individuals who wished to participate in the survey were included. Similarly, individuals were contacted by phone thus eliminating landowners without telephone service. Similarly, landowners who incur losses due to wildlife damages may not appear on current map publications. Although the potential for bias does exist and the extent remains uncertain, it is assumed to be small.

Finally, difficulties arise when attempting to remove all factors influencing farmer decisions regarding waterfowl habitat retention. As stated earlier, landowners affected by waterfowl depredation and those unaffected are selected from the same township. However, many factors which may influence the decision of landowners regarding the retention of wildlife habitat are bound to remain. For example, soil and weather conditions may vary considerably within townships. Thus, although care has been taken to avoid such discrepancies, the difficulty of the task is appreciated.

Of the 192 survey packages sent to participating landowners 117 were returned. The information from each questionnaire was coded and analyzed using an SPSS computer program package available at the University of Alberta. The results of the analysis are described in the following chapter.

V. RESULTS

A. Overall Results of Mail-Out Survey

Completed questionnaires were returned by 117 of the 192 survey participants giving a response rate of 61 percent. Tables presenting the results of the mail-out questionnaire are provided in Appendix F. Ninety-one percent of the respondents spent the majority of their youth in rural areas (population less than 1000). Farming experience, measured in years, ranged from two years to 79 years with the average being 27 years. The average farm size in 1982 consisted of 1541 acres. Land producing cereal grains (ie. wheat, oats, barley) average 405 acres while lands producing other crops average 1136 acres. The majority of the crops grown on farms participating in this survey are produced for sale.

Wildlife in this survey is subdivided into five broad categories including big game, upland birds, ducks, geese and a miscellaneous other wildlife group. The frequency of wildlife groups seen on farms surveyed is presented in Table 29, Appendix F. Seventy-five percent of the survey respondents consider a portion of their land to be suitable for wildlife habitat. Of these 87 individuals, 64 percent indicate the availibility of at least one habitat area. Thirty-five percent and six percent suggest the existence of two and three habitat areas respectively. The average size of the primary habitat areas described by landowners is 802 acres. Average sizes for all secondary and tertiary habitat areas described by landowners are 257 acres and 797 acres respectively. Landowners matching wildlife groups to habitat areas indicate big game species as the most common wildlife group to use these areas.

Habitat areas are described as bush, slough, pasture land, all land within the farm unit, damsites, or a miscellaneous other category. Bush areas constitute 47 percent of all habitat areas described. Of the remaining five habitat descriptions sloughs are most common. Crops grown in the vicinity of the habitat areas described are grouped according to cereal grains (wheat, barley, oats) or other crops. Seventy-four percent of the crops grown in the immediate vicinity of habitat areas are cereal grains.

Of the 117 survey respondents, 88 (75 percent) incur damages to crops or livestock due to wildlife depredation. Using the crop groups described in the preceeding

paragraph, 78 percent of wildlife damages indicated by survey participants are incident on cereal grains. Less than one percent of the landowners surveyed indicate livestock losses due to the wildlife depredation. Fifty-five percent of the respondents indicate ducks are the primary cause of the wildlife depredation problems. Using a scale from one to five (1=rare, 5=frequent) 34 percent of the landowners responding describe wildlife damages as frequent. An average rating of 3.2 is indicated by survey participants to express the frequency of wildlife damage.

A number of chi-square tests of significance (following Mason, 1978) are used to identify significant differences between individuals incurring wildlife damages and those having no wildlife depredation problems. The chi-square test of significance allows one to determine whether any significant difference exists between the sample groups under comparison. For example, Table 5.1 on the following page compares individuals incurring wildlife damages and those having no depredation problems with respect to landowner farm experience. In this instance the hypotheses under consideration are:

Null hypothesis (H_0) = there is no significant difference in farm experience between landowners incurring wildlife damages and those having no depredation problem.

Alternate hypothesis (H_1) = a difference between landowner groups exists with regards to farm experience.

Each chi-square test of significance involves both a null and alternate hypothesis. Acceptance of one hypothesis is identical to the rejection of the other. Results indicate differences between individuals incurring damages and those with no depredation problems are not significant with respect to landowner farm experience. However, differences between these groups arise with respect to the acres of cereal grains (barley, wheat, oats) and acres of land producing other crops. Results of these chi-square tests are presented in Tables 5.1 to 5.3 on the following pages. Some difficulty in using the chi-square analysis arises when there are few observations for a given variable. This problem occurs in several of the chi-square tests conducted. Therefore some caution in interpreting the results is warranted.

Among the 117 survey respondents 63 (54 percent) expressed an awareness of available compensation/prevention programs for wildlife damages. Landowners applying

Table 5.1. Landowner Farm Experience by Wildlife Damage Occurrence

Experience (yrs)	Damage Occurrence		
	Yes	No	
1 - 10	12	6	18
11 - 20	20	6	26
21 - 30	22	5	27
over 30	32	12	44
	86	29	115

$X^2 = 1.43$ Cells with E.F. <5

Sig = 0.698 1 of 8 (12.5%)

Table 5.2. Total Acres of Cereal Grain by Wildlife Damage Occurrence

Acres	Damage Occurrence		
	Yes	No	
1 - 160	16	4	20
161 - 320	17	14	31
321 - 460	20	3	23
481 - 640	8	1	9
over 640	21	1	22
	82	23	105

$X^2 = 15.39$ Cells with E.F. <5

Sig = 0.004 3 of 10 (30%)

Table 5.3. Total Acres of Land Producing Other Crops by Wildlife Damage Occurrence

Acres	Damage Occurrence		
	Yes	No	
1 - 60	13	7	20
161 - 320	12	6	18
321 - 480	14	14	28
481 - 640	13	5	18
over 640	31	4	35
	83	36	119

$X^2 = 5.41$ Cells with E.F. <5

Sig = 0.248 4 of 10 (40%)

for wildlife damage assistances indicate programs using a variety of descriptions (Table 32, Appendix F). Eighty-four percent of those individuals expressing knowledge of assistance for wildlife depredation describe at least one program. Applications for assistance concerning duck damages constitute 65 percent of the total complaints described. No official complaints were registered against upland birds or geese. Sixty percent of the requests to the Alberta Hail and Crop Insurance Corporation for assistance were made verbally while the remaining 40 percent were filed in writing.

Using a scale from one to five (1=unsatisfactory, 5=satisfactory) 43 respondents rated the assistance programs for wildlife damages to which they applied. Three respondents gave ratings for two programs. The most common rating is 1.0 (43 percent) followed by 4.0 (26 percent) with 3.5 as the average rating. Several reasons were given for the program ratings. Thirty-seven percent of the respondents offering an opinion indicated low compensation as the reason behind the ratings given. Negative comments regarding assistance programs contributed 67 percent of the total opinions expressed. Positive comments include acknowledgments to competent inspectors or gratification for receiving minor assistance (Table 33, Appendix F).

Of the 117 survey respondents 27 (23 percent) have made adjustments to the farm operation as a result of wildlife damages. Seven individuals have made more than one adjustment. The most common adjustments described are alterations to cropping patterns (Table 34, Appendix F). The average success of these adjustments in preventing wildlife depredation is represented by 3.3 on a scale from one to five (1=unsuccessful, 5=successful). In comparison, 26 of the 117 survey respondents make adjustments or practice farming techniques which benefit wildlife. Changes include leaving habitat areas, building dugouts, conscientious cropping techniques, providing shelter, allowing undergrowth to develop in ditches, and a miscellaneous other category (Table 35, Appendix F). The average success of these adjustments rated by landowners is represented by 3.0 using a scale from one to five (1=insignificant increase, 5=significant increase). Thirteen respondents provide cost estimates for adjustments which benefit wildlife. Sixteen respondents provide cost estimates for adjustments due to wildlife damages which alter land use patterns (Table 36, Appendix F). Fifteen individuals have applied and received permission to conduct water storage projects under the Water Resources Act. Among the nine applications made for water drainage permits, six have been accepted. No indication of projects completed is given.

Of the 117 survey respondents 51 (44 percent) undertake actions to deter wildlife damages which do not alter land use decisions directly. These actions include setting up scare crows and chasing wildlife, use of scare cannons, allowing hunting, personnally shooting at wildlife and a miscellaneous other category. The use of scare crows and chasing techniques is the most common action undertaken by survey respondents. Cost estimates are provided by 22 individuals (Table 37, Appendix F). In addition, several individuals indicate actions taken which do not incur costs to the landowners.

Chi-square tests of significance are used to identify differences between individuals incurring damages but not applying for assistance and individuals receiving assistance. Results indicate differences between these groups are not significant at the .05 level when comparing landowner farming experience, total grain acres or the total acres of land producing other crops. However, available habitat differs significantly between groups at the 0.1 level but not at the 0.05 level. Similarly, differences between groups are evident at the .05 level when comparing sightings of big game species, ducks,

and geese. There does not appear to be a significant difference between group sightings of upland birds and species in the miscellaneous other wildlife category.

Of the 117 survey respondents 86 (74 percent) suggest landowners should accept some wildlife depredation as a normal expense of the farm operation. However, 65 individuals indicate the frequency of wildlife damage would alter the amount of wildlife damage that should be accepted. One hundred and seven respondents indicate compensation should be paid to individuals incurring losses due to wildlife depredation. Eighty-five (80 percent) of the 106 individuals responding suggest compensation should be based on a percentage of the market value of the crop / livestock lost. Individual suggestions regarding adequate compensation range from five percent to 100 percent with the average being 86 percent. Forty-nine respondents indicate compensation should be paid on an equal basis regardless of the wildlife inflicting damages or the crop / livestock affected. Landowners offering an opinon indicate the primary source of funding should originate from the provincial government.

Tables 5.4 to 5.6, on the following pages, compare respondents opinions regarding depredation and compensation payments. Table 5.4 compares landowners incurring wildlife damages with those not incurring wildlife damages as to their acceptance of wildlife depredation. Results of the chi-square test indicate the difference in attitudes towards damage acceptance between respondent groups is insignificant at the .05 level. In Table 5.5 opinions regarding the effect of damage frequency on landowner acceptance of wildlife damages are compared between respondents grouped according to damage occurence. Results of this chi-square test indicate the differences are insignificant at the .05 level. In Table 5.6 opinions regarding the payment of compensation for wildlife damages are compared between respondents grouped according to damage occurrence. Results of the chi-square test indicate a significant difference exists between respondent groups. However, in calculating the chi-square value, 25 percent of the cells in the 2x2 table presented have expected frequency values less than five. In this instance, the SPSS computer package used to calculate the chi-square value adjusts for this limitation using 'the Yates correction'[9]

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[9]According to Hays (1973), the Yates correction reduces the absolute value of the difference between observed and expected frequences by 0.5 for each category. The adjustment can be used when the expected frequency of one cell in a 2x2 table is less than five.

Table 5.4. Opinions on the Acceptance of Wildlife Damages

Acceptance	Damage Occurrence		
	Yes	No	
Yes	63	23	86
No	25	4	29
	88	27	115

X^2 =2.025

Sig = 0.155

Table 5.5. Effect of Damage Frequency on the Acceptance of Depredation

Effect	Damage Occurrence		
	Yes	No	
Yes	53	11	64
No	29	12	41
	82	23	105

X^2 =2.132

Sig = 0.144

Table 5.6. Opinions on Compensation by Wildlife Damage Occurence

Compensation	Damage Occurrence		
	Yes	No	
Yes	86	21	107
No	2	6	8
	88	27	115

Corrected X^2=9.809

Sig = 0.002

Ten respondents indicate they are considering future adjustments to their farm operation due to wildlife damages. Projects under consideration are alterations in cropping practices, direct combining and/or grain drying, scare tactics, land clearing, ditching and fencing. Crop pattern changes are mentioned by 40 percent of respondents, while ditching techniques represent 20 percent of the suggested future adjustments. Each of the remaining future adjustments is mentioned once. Estimated costs for the future adjustments described range from $25 to $40,000 with the average cost being $10,364 (Table 43, Appendix F). These cost estimates may be high relative to benefits derived from reduced wildlife depredations. However, landowners indicating costs may realize benefits from these projects in addition to decreased wildlife depredation. For example, landowner interviews indicate the purchase of grain dryers to reduce waterfowl depredation are intended primarily to increase harvest efficiency.

Of the 117 survey respondents, 46 acknowledge awareness of wildlife sanctuaries, and/or feeding stations within the vicinity. Seventy-two percent of the landowners expressing an opinion suggest these areas do not affect hunting in their area. Postive and negative effects are mentioned equally by the remaining individuals expressing an opinion. Conversely, 57 percent of the 35 respondents offering an opinion indicate these areas have no affect on wildlife depredations to agricultural crops/livestock in their area. Eleven individuals suggest a correlation exists but did not specify a positive or negative effect. Three individuals indicate these areas decrease wildlife depredation while one individual indicates a positive correlation exists.

Sixty-three (54 percent) respondents acknowledge their involvement in hunting activities. Thirty-four of those individuals hunt primarily on their own land. In addition to hunting activities, landowners where asked to comment on the courtesy of hunters using their land. Forty-six respondents indicate a positive attitude towards hunters in general. Negative attitudes contribute 24 percent of the remaining land owner sentiment towards hunters. Seventeen landowners express mixed feelings toward hunters while two respondents indicate they only allow friends to hunt on land under their control.

B. Waterfowl Depredation

Of the 88 individuals incurring wildlife damages 62 (70 percent) respondents have lost revenue due to waterfowl depredation. Thirty-six (58 percent) of these landowners have applied for some assistance to alleviate or prevent losses. The remaining 26 landowners suffering damages from waterfowl have never applied for assistance. Within the group incurring waterfowl damages but not applying for assistance, 12 respondents (46 percent) indicate they are unaware of available programs. The remaining 14 individuals indicate an awareness of at least one program providing assistance to landowners incurring wildlife depredations. Eight of the 14 knowledgable respondents describe programs available to alleviate or prevent wildlife damages. The most common program description is merely the Alberta Government program. In comparison, 66 percent of those respondents incurring waterfowl damages and applying for some assistance mention the Alberta Hail and Crop Insurance program and the Wildlife Damage Fund specifically.

Seventy-one percent of the landowners incurring waterfowl damage to agricultural crops indicate the existence of land suitable for wildlife within their farm operation. Landowners incurring waterfowl damages but not applying for assistance use the terms slough or dam in 31 percent of the first habitat area descriptions. Seventeen percent of the second habitat areas are described as slough or dam areas. No individual incurring waterfowl damage and not applying for assistance indicates the existence of three habitat areas on their land. In comparison, landowners applying for waterfowl damage assistance used the terms slough or dam for 32 percent, 76 percent and 20 percent of the first, second and third habitat area descriptions respectively.[10]

Landowners incurring waterfowl depredation and not applying for assistance indicate 22 percent of the available habitat areas are suitable for waterfowl. Conversely, landowners incurring waterfowl damages and applying for wildlife damage assistance indicate 42 percent of the available habitat is suitable for waterfowl. Similarly, Table 5.7, (page 51), indicates a difference in the frequency of wildlife damages between these two

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[10]Water is not necessarily the only indication of waterfowl habitat. Many waterfowl species may nest some distance from water if cover is adequate. Similarly, the existence of areas where water is present may not provide suitable waterfowl habitat in the absence of nesting cover or food sources. However, for the purposes of this survey a high correlation between water and waterfowl habitat is assumed.

landowner groups. Landowners incurring waterfowl damages but not applying for assistance indicate less frequent wildlife damage to crops than landowners incurring waterfowl depredation and applying for assistance. Although landowners in both groups incur other wildlife damages waterfowl depredation is indicated most often. Table 5.8 indicates the frequency of various wildlife group damage and the percentage of total depredation each wildlife group contributes.

The comparisons suggest a relationship between waterfowl damages and habitat areas suitable for waterfowl. In addition, landowner opinions regarding the frequency of wildlife damages coincide with assistance applications. In instances where the frequency and intensity of damage is low landowners may be willing to accept lost revenue due to wildlife depredation. (Recall 74 percent of the survey respondents indicate landowners should accept some losses due to wildlife depredation).

Using a scale from one to five (1=unsatisfactory, 5=satisfactory) landowners incurring waterfowl depredation rate assistance programs as 2.7. Of the 36 individuals incurring waterfowl depredations and applying for assistance 22 incur waterfowl damage exclusively. The average rating for waterfowl depredation assistance programs by this group is 2.6 using the five-point scale.

For comparison purposes, cost estimates for land use adjustments due to wildlife damages and adjustments which benefit wildlife are analyzed using four specific landowner categories. Likewise, cost estimates for actions to deter wildlife damages but not affecting land use decisions are compared in a similar manner. The categories used for these comparisons are as follows:

1. All landowners incurring damages to crops from waterfowl and applying for wildlife damages assistance.
2. All landowners incurring damages to crops from waterfowl and NOT applying for wildlife damage assistance.
3. All landowners incurring waterfowl damages exclusively, and applying for waterfowl damage assistance.
4. All landowners incurring waterfowl damages exclusively, and NOT applying for waterfowl damage assistance.

Table 5.7. Frequency of Wildlife Damage Intensity Rating Among Landowners Incurring Waterfowl Depredation

Damage Intensity	Landowners Not Applying	Percent	Landowners Applying	Percent
1 (Rare)	12	31.6	6	10.2
2	11	28.9	12	20.3
3	9	23.7	6	10.2
4	3	7.9	7	11.8
5 (Frequent)	3	7.9	28	47.5
	38	100.0	59	100.0

Table 5.8. Frequency of Wildlife Group Damages on Farms Incurring Waterfowl Depredation

Wildlife Group	Landowners Not Applying	Percent	Landowners Applying	Percent
Big Game	5	12.8	7	12.1
Upland Birds	-	-	-	-
Ducks	26	66.7	44	75.9
Geese	2	5.1	1	1.7
Other Wildlife	6	15.4	6	10.3
	39	100.0	58	100.0

Within this section these groups are referred to as category 1,2,3, and 4 respectively. This comparison is used to allow the inclusion of all individuals incurring waterfowl depredation. However, to emphasize specific relationships between landowner attitudes and waterfowl depredation exclusivily, categories 3 and 4 are included.

Among the 36 landowners in the first category, 14 (or 39 percent) have made land use adjustments to the farm operations due to wildlife damages. Similarly, eight of these 36 individuals have made adjustments which benefit wildlife. In comparison, nine percent of the landowners in category 2 have made adjustments due to wildlife depredations. Among the 20 individuals in the second category, 35 percent have undertaken a specific enhancement to benefit wildlife in some manner.

Tables 5.9, 5.10 and 5.11 present cost estimates for all adjustments or actions indicated by respondents according to the categories described. Nine landowners in category 1 offer cost information regarding adjustments due to wildlife damages. Similarly, four landowners in this category offer cost estimates for projects which benefit wildlife. Costs for adjustments due to wildlife damage range from $700 to $99,000. Cost estimates for adjustments or wildlife enhancing farming practices range from $300 to $6200.

Among the 26 survey respondents in the second category two individuals have made adjustments to the farm operation due to wildlife damages. Nine of these 26 individuals made adjustments which benefit wildlife. Only zero or minimal cost estimates are indicated for adjustments due to wildlife damages in category 2. However, three cost estimates for adjustments which benefit wildlife range from $50 to $2500.

Landowners incurring waterfowl depredation exclusively constitute 62 percent of all survey respondents who indicate the existence of some waterfowl damages. Of the 38 individuals incurring waterfowl depredation exclusively, 22 and 16 may be grouped into categories 3 and 4 respectively. Of the 22 individuals in the third category, four respondents have made adjustments due to wildlife damages. The three cost estimates provided for these adjustments range from $700 to $16,000. The only cost estimate for adjustments which benefit wildlife in category 3 is $1500.

Five individuals within the 4th category have made adjustments which would benefit wildlife. Three respondents indicate cost estimates ranging from $50 to $2500 with the average cost being $1517. No adjustments due to wildlife damages are under taken by individuals in this category.

Several individuals indicating minimal costs or costs which cannot be estimated are not included in Tables 5.9, 5.10 and 5.11. Two respondents in category 1 made

Table 5.9. Cost Estimates for Land Use Adjustments Due to Wildlife Depredation by Category

Cost Estimates (Dollars)	Category 1	Category 2	Category 3	Category 4
under 100	-	-	-	-
100 - 500	-	-	-	-
501 - 1000	3	-	1	-
1001 - 5000	7	-	3	-
5001 - 10,000	1	-	-	-
over 10,000	3	-	2	-
Total	154,200	-	34,700	-
Average	14,889	-	5783	-

Table 5.10. Cost Estimates for Land Use Adjustments Which Benefit Wildlife by Category

Cost Estimates (Dollars)	Category 1	Category 2	Category 3	Category 4
under 100	-	1	-	1
100 - 500	1	1	-	-
501 - 1000	-	-	-	-
1001 - 5000	3	2	1	1
5001 - 10,000	1	-	-	-
over 10,000	-	-	-	-
Total	16,000	4850	1500	2050
Average	3,200	1213	1500	1025

Table 5.11. Cost Estimates for Actions to Deter Wildlife Damages by Category

Cost Estimates (Dollars)	Category 1	Category 2	Category 3	Category 4
under 100	5	4	2	2
100 - 500	2	3	1	-
501 - 1000	2	-	-	-
1001 - 5000	1	-	-	-
5001 - 10,000	-	-	-	-
over 10,000	-	-	-	-
Total	4135	1015	260	45
Average	414	145	87	23

adjustments of this nature due to wildlife damages. Similarly, two respondents in category 1 have made adjustments to benefit wildlife which were difficult to estimate. Three adjustments of each type considered as minimal or zero cost projects were made by individuals in category 2. Respondents in the third category describe an adjustment of each type as difficult to estimate or of minimal cost. Three respondents in category 4 describe adjustments to benefit wildlife which incur no costs.

As mentioned previously, 51 survey respondents undertake some action to deter wildlife depredations which do not involve land use changes. A total of 56 actions are described indicating that several individuals use more than one technique to combat wildlife depredations (Table 42, Appendix F). Among the 36 individuals in the first category, 26 (72 percent) attempt to deter wildlife depredations by actions other than those altering land use decisions. Eleven individuals describe the actions taken. The use of scare crows and chasing techniques contribute 38 percent of the five actions described. Costs to undertake these actions range from $10 to $1100 with the average cost being $345. Twelve respondents (46 percent) within the second cateogry undertake some action to deter wildlife depredations which do not require land use alterations. Six individuals provide cost estimates ranging from $2 to $400. In the third category, 16 respondents indicate the use of actions to deter waterfowl which do not require land use alterations. The cost estimates provided by individuals in this category range from $10 to

$200. Thirty-eight percent of the respondents in category 4 engage in at least one action to deter wildlife depredations. Of these six individuals, four describe the techniques used. The two cost estimates provided are $20 and $25.

Although few cost estimates for the various adjustments or actions are available, differences between categories are apparent. A greater number of individuals in categories 1 and 3 make adjustments due to wildlife depredations than individuals in categories 2 and 4 respectively. Similarly, a greater number of individuals in categories 1 and 3 undertake actions to deter wildlife damages (not affecting land use decisions) than in categories 2 and 4 respectively. Cost estimates for these adjustments and actions are greater on average in categories 1 and 3 than in categories 2 and 4 respectively. These results appear to coincide with earlier findings. In the instances where individuals apply for wildlife depredation, damages are more frequent, on average, than in cases were individuals do not apply for damage assistance. As a result, it would seem plausible that landowners in the categories incurring frequent damages would undertake greater adjustments to prevent depredation problems.

However, as mentioned previously, landowners with frequent damages have a greater amount of wildlife habitat situated on their land. Thus, the possiblity that adjustments due to wildlife can be made (with regard to habitat areas) is more likely in categories 1 and 3. In contrast, actions to deter wildlife depredations are possible regardless of the existence of habitat. As a result, it appears landowners undertake adjustments / actions depending on the frequency or extent of damages. Similarly, the amount of funds expended to reduce wildlife depredations appears to increase as the frequency and extent of damages increase. Differences in frequency and costs for adjustments which benefit wildlife are not readily apparent among landowners grouped according to the use of wildlife / waterfowl damage assistance programs.

In addition to adjustments and / or actions undertaken in the past, individuals in category 1 indicate the possibility of future adjustments due to wildlife damages. Two of the six adjustments suggested include ditching or draining of habitat areas. Since all landowners in category 1 have incurred waterfowl depredation the reduction of wetland areas is likely undertaken to reduce waterfowl damages. Thus, the potential for continuing reductions in waterfowl habitat is apparent.

C. Wildlife Damage Fund Results

In chapter 2, reference is made to the apparent inconsistency of the actual loss / compensation paid ratios resulting from landowner damage settlements. The actual loss / compensation paid ratio reflects the portion of lost revenue due to wildlife depredation which is repaid to landowners from the wildlife damage fund. Table 10, Appendix B, presents the average AL / CP ratio by year for the period 1964 to 1981. This information represents a summary of the AL / CP ratios on a township basis. However, an accurate indication of the actual AL / CP ratios representing individual landowners settlements is not forthcoming. To obtain an accurate perspective, AL / CP ratios for respondents to the mail-out questionnaires are presented in Table 44, Appendix F. Among the 117 respondents, 26 individuals (22 percent) could be matched to Alberta Hail and Crop Insurance data to obtain a corresponding AL / CP ratio. Table 45, Appendix F, lists these AL / CP ratios from the lowest to highest and provides corresponding AL-CP calculations. The average AL / CP ratios for respondents in this survey range from 1.69 to 7.23 during the period 1964 to 1981 inclusive. Consequently, compensation paid to individuals in this survey range from 61 percent to 14 percent of the actual value of lost revenue. The range of AL / CP ratios is an indication of the inconsistency in compensation payments on an individual basis.

Several concerns regarding the payment of compensation for wildlife depredation have become apparent throughout the study. The original intention of the wildlife damage fund is somewhat ambiguous. However, discussions with federal and provincial government officials and members of local fish and game organizations provide some clarification. The primary intention appears two fold. The wildlife damage fund would repay landowners for out of pocket production costs (generally fertilizer and seed costs) and, hopefully, attain better relations between landowners and hunters. (Recall, part of the funding for compensation is obtained through the sale of hunting permits.) Certainly there is some deviation in these production costs relative to the market value of crops grown among farms. Production on class 1 and 2 soils will be greater per acre relative to fertilizer and seed application than in areas with less productive land. Similarily, irrigation in the southern areas in Alberta adds greatly to output although not included in the production cost definition. Nonetheless, it is unlikely that fertilizer and seed costs would vary from 14

percent to 61 percent of the market value of cereal crops. (Of the 26 AL/CP ratios listed in Table 44, 88 percent refer to compensation paid for waterfowl damage to wheat, barley or oats.)

Waterfowl inflict the major portion of crop depredation to cereal grains during the harvest season. At this point in the production cycle most of the costs of production facing the landowner have been incurred. Certainly the landowner has much more invested in crops than the cost of fertilizer and seed. The crop lying in swath prior to combining represents cash to the landowner. Since most farmers are in business to generate income logic suggests compensation payments to landowners should be a direct portion of the market value of the lost crop. (This conclusion is in keeping with suggestions from respondents to the mail-out survey. Recall, 80 percent of the respondents offering an opinion suggest compensation should be based on the market value of grain.)

Ascertaining a "fair" level of compensation as a percentage of actual loss may present some difficulties. Certainly, many landowners incur a greater share of costs to maintain waterfowl populations than other members of society. However, waterfowl species may not necessarily require the consumption of cereal grains for their survival. Hence, the loss of cereal grain revenue may not be viewed as a necessary input to waterfowl production. Nonetheless, landowners are restricted by law in the use of wildlife determents to protect agricultural crops; and, waterfowl depredation is inevitable in many instances.

The previous section of this chapter does not indicate a significant effect of the present compensation program for waterfowl depredations on private land use decisions. Rather, results indicate the use of compensation programs to simply reduce the revenue losses and/or to augment the cost of land use adjustments due to wildlife damages. Hence, interpreting gains in habitat retention through increased compensation is a difficult process. Interviews with Ducks Unlimited (Canada) personnel indicate increased compensation would reduce landowner opposition to waterfowl habitat development projects. However, proof of this argument has not been documented.

Altering the method of calculating compensation payments does, however, raise concerns. Changes in the program may solicit opposition from landowners receiving above average remuneration under the existing program. Similarly, under the present

program individuals incurring frequent damages may suffer greater losses in revenue overtime.[11] Individual respondents rating for prevention/assistance programs and corresponding AL/CP ratio's are presented in Table 5.12, on the following page. In addition, the frequency of damage in years and the dollar value of crop damages left unpaid (AL-CP) for each individual respondent are presented. The program rating variable (RATE) is regressed with each of the independnt variables YRS, ALCP, and ACP.

The correlation matrix for variables included in these regressions are provided in Table 5.13. Variables showing a perfect correlation of 1.000 appear along the diagonal of the correlation matrix. The dependent variable RATE is not highly correlated with any of the three independent variables; ALCP, ACP, or YRS. However, a highly positive correlation does exist between variables ACP and YRS. Such a correlation suggests the more frequent the wildlife damages incurred the higher the losses in revenue left uncompensated under the existing program. The existing program does not allow any special considerations in compensation payments to individuals incurring frequent damages over a period of several years. As a result, the present compensation program in itself does not adequately address the imbalance of benefits and costs incident on landowners incurring frequent waterfowl damages.

Table 5.13. Correlation Matrix for Variables Included in RATE Regressions

	RATE	ALCP	ACP	YRS
RATE	1.000	-0.066	-0.195	-0.151
ALCP		1.000	0.054	-.118
ACP			1.000	0.880
YRS				1.000

The following chapter summarizes the results of the thesis with regard to the primary objectives outlined in the introduction. A number of conclusions are drawn from the results and a series of recommendations are offered for consideration.

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[11]For a detailed description of the present calculation of compensation payments see Appendix G.

Table 5.12. Values for Variables Included in RATE Regressions

Program Rating (RATE)	Frequency of Damage (YRS)	AL/CP (ALCP)	AL-CP (ACP)
2	2	1.63	$ 1458
4	2	1.97	1957
3	2	2.01	964
1	1	2.11	656
4	1	2.18	525
3	1	2.20	849
2	2	2.62	3526
1	3	2.87	3142
4	1	2.93	1774
2	1	2.96	488
1	10	2.97	32,649
4	1	2.97	4020
3	7	3.10	7064
1	1	3.14	1438
4	1	3.15	2205
1	2	3.24	1858
1	1	3.58	2434
4	2	3.75	2453
4	1	3.87	1396
3	1	4.09	1254
1	1	4.36	1059
5	1	4.52	771
4	3	5.00	9198
3	2	5.79	4718
2	1	6.80	3819
1	1	7.23	3104

AL = Actual Loss; CP = Compensation Paid

VI. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A. Summary

Central to issues concerning waterfowl production in Alberta is the specification of property rights. Waterfowl species are considered the property of the general public, whereas in many instances, waterfowl habitat areas are privately owned. Direct costs for waterfowl production are distributed amongst the general public through taxation mechanisms. Other concerned user groups (ie. hunters, private organizations) add to the funds available for waterfowl production through taxes on hunting equipment and private donations to conservation programs. However, in certain instances, the direct costs of waterfowl habitat retention is incurred by private landowners. Costs may include land taxes, lost productivity, decreased yields and values of crops, and lost revenue due to crop depredation from waterfowl. Since private individuals do not own a portion of the waterfowl resource, ownership transfers to gain revenue and offset the cost of habitat retention are not possible. Consequently, landowners may consider losses in revenue to be significantly greater than the benefits derived from the waterfowl resource.

The wildlife damage fund is a form of collective action established to offset the imbalance of benefits and costs associated with maintaining waterfowl populations. The purpose of this thesis is to examine the role of the present compensation program in decisions regarding waterfowl habitat on private lands in Alberta. Five primary objectives are outlined in the introduction. Four objectives are addressed in this summary section. The fifth objective is addressed in the recommendations section of this chapter.

The first objective is to determine the current extent of crop depredation in recent years relative to past reports. An analysis of the Alberta Hail and Crop Insurance data summarizing waterfowl crop depredation during the period 1964 to 1981 indicates total compensation paid during the period 1964 to 1981 ranged from $77,342 in 1967 to $2,401, 497 in 1969. These values are expressed in 1981 dollars terms. In comparison, actual loss values expressed in 1981 dollars, range from a low in 1967 of $208,541 to a high in 1973 of $12,885,310. From 1964 to 1981, compensation paid figures are below average in 11 years and above average in seven years. From 1976 to 1981, compensation paid figures are below average in three years and above average in three years. Similar

results are indicated for actual loss figures during the period 1964 to 1981 and the more recent grouping by year from 1976 to 1981.

The number of townships from which damage claims are initiated averages 511 per year during 1964 to 1981. In each year from 1964 to 1971 townships from which individual damage claims were initiated are below the overall average. In two years between 1972 and 1981 individual damage claims were initiated from a less than average number of townships. As a result, the number of townships from which damage claims are originating appears to have increased somewhat in recent years. However, the actual loss and compensation paid values in recent years do not differ greatly from the average.

The compensation program has undergone several amendments since its inception in 1964. Major changes have occured to the maximum limit of compensation paid per acre. From 1964 to 1972 the maximum compensation paid per acre was $15. This limit was increased to $25 during the period 1973 to 1977 and increased again to $50 in 1978. Analysis of the compensation payments indicates that changes to the maximum limit per acre have kept pace with inflation during the period 1964 to 1978. However, changes after the $25 to $50 increase in 1978 do not appear to have kept pace with inflation.

The second objective is to determine the extent to which land use changes have affected wetland availabality in Alberta. An analysis of data provided by the Water Resources Branch indicates water diversion projects make up 66 percent of the applications considered from 1964 to 1981. Water storage and a miscellaneous other category comprise the remaining 34 percent. (A variety of project headings are included under the Water Resources Branch. However, only those described as diversion, storage or other were considered here.) Of the total 842 applications for diversion, 460 are filed by municipal or provincial government agencies, 152 by private companies, 229 by private individuals and one by Ducks Unlimited (Canada). In comparison, of the total 435 applications for water storage or other projects 280 are filed by Ducks Unlimited (Canada), 105 by government agencies, 30 by private companies, and 20 by private landowners. These figures indicate private individuals apply for diversion projects 11 times more often than projects classified as storage or other. Assuming a positive correlation exists between water and waterfowl habitat, results indicate private land use changes are significantly affecting waterfowl habitat in Alberta.

The third objective is to examine the current compensation program with respect to the distribution of funds to landowners affected by waterfowl depredation. Although other forms of wildlife depredation are covered under the wildlife damage fund, the majority of claim settlements deal with waterfowl damage to grain crops. Initially, the analysis of the distribution of wildlife damage funds was conducted by township in chapter 2. Compensation received by individuals as a proportion of losses incurred range from 17 percent in 1973 to 54 percent in 1964 on a township basis. Although these results indicate a significant variation in payments, a comparison of compensation paid and actual loss values on a township basis is not conclusive. As a result, individual landowner actual loss / compensation paid ratios are compared. Results of the second analysis confirm the variation in fund payments to landowners. In this instance, compensation received by individual landowners as a proportion of losses incurred range form 14 to 61 percent. In addition, a significant correlation between lost revenue NOT compensated and the frequency of damage occurence is high. Thus, the present compensation program produces significant variations in compensation paid to claimants as a percentage of actual losses on an annual basis. Similarly, the amount of lost revenue left unpaid varies significantly among landowners over the period in which the wildlife damage program has existed.

The fourth objective is to identify the role of the compensation program in land use changes altering waterfowl habitat in Alberta. Landowners receiving waterfowl damage compensation undertake land adjustments due to depredation problems to a greater extent than those not compensated. Among the 14 individuals receiving compensation and making adjustments, two mention draining or filling of wetland areas. Only two individuals incurring waterfowl depredation and not applying for compensation have undertaken land adjustments due to waterfowl damages. Eight of 36 (22 percent) individuals receiving compensation indicate they have made alterations to benefit wildlife. In comparison, nine of 26 (35 percent) respondents incurring waterfowl damage but not applying for compensation have made alterations to benefit wildlife.

Landowners applying for compensation rate the frequency of damage to crops at a higher level than those individuals incurring damages but not applying. Similarily, habitat areas are more abundant on property held by landowners incurring wildlife damages than

on land were depredation issues are not a concern.

B. Conclusion

The results indicate that the present compensation program for waterfowl depredation plays a limited role in landowners decisions to retain waterfowl habitat areas on private lands. The results of the mail-out questionnaire confirm earlier reports (Renewable Resources 1969) that waterfowl depredation is linked to the nearness to habitat areas. In general, landowners close to habitat areas incur greater damages to crops from waterfowl. Consequently, many landowners apply for compensation to offset the revenue losses. Landowners with habitat areas on land under their control have the opportunity to make adjustments to their land management patterns (ie. drain / fill sloughs etc.) which would affect waterfowl production. However, landowners who alter habitat areas may do so for reasons other than to reduce crop depredation. Interviews with landowners indicate production increases and the possibility of reducing costs in working the land are primary reasons. Reductions in crop depredation is noted by landowners but is not the primary reason for altering habitat areas.

Nonetheless, discussions with Ducks Unlimited (Canada) personnel indicate compensation programs may play an important role in waterfowl habitat enhancement and development. When individual landowners have no intention of removing habitat areas due to economic or technical constraints, primary losses in revenue may be due to crop depredation. Similarly, when planned development of waterfowl habitat is to occur on public lands, private landowners do not incur costs other than potential crop depredation. In these instances, a compensation program which is adequate in the opinion of landowners may play a role in reducing opposition to habitat enhancement or development. Similarly, several states and provinces indicate the existence of a relationship between crop depredation and habitat loss. Thus, the level of compensation may be crucial. Results indicate present compensation for waterfowl depredation is for the most part inadequate in eliciting a positive response by landowners toward increasing waterfowl production.[12]

Regardless, the compensation program does redistribute the incidence of benefits and costs for waterfowl production among members of society. However, present

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[12]This conclusion is in agreement with earlier work by Stier and Bishop (1981).

variations in the payments of compensation relative to losses incurred detract from the administrative efficiency of the compensation program. Basing payments on a portion of the production costs requires continual upgrading of maximum allowable limits per acre to offset inflation. Similary, production costs can vary substantially throughout the province on a per acre basis. Thus, basing payments on a portion of the production costs requires some formula which ensures the inclusion of each regions peculiarities.

C. Recommendations

A number of recommendations can be made given the results of this study. However, all of these recommendations are intended to address a portion of the imbalance in the benefits and costs incident on landowners as a result of present property rights legislation. Until an adequate portion of the imbalance is corrected, programs will be largely ineffective in elliciting positive response from landowners towards waterfowl production on a provincial scale.

Landowners suggest adjusters accessing crop losses are unavailable at times during the harvest season. As a result, Alberta Hail and Crop Insurance should examine the possibility of increasing the numbers of trained adjusters to access wildlife damage claims. Similarly, making adjusters available on weekends during peak harvest periods would decrease the loss in time to landowners waiting for damage accessments.

The compensation program may be influential in eliciting positive attitudes on the part of certain landowners towards waterfowl habitat enhancement and development projects on public lands. However, research in this area is not conclusive. Each project should be accessed on individual merit with the inclusion of increased compensation for crop depredation if warranted. Further research is required to assess the value society places on waterfowl and waterfowl habitat. Such research should include studies to determine the attitudes of hunters and non-consumptive users toward increased compensation for crop depredation. A suggested questionnaire format to derive information from hunters is developed (Appendix H). A similar approach could be developed to obtain information from the non-consumptive sectors.

Efforts to reduce the variation in compensation payments to claimants from the wildlife damage fund may be warranted. In this regard, policy makers could consider

basing compensation accessments on the value of crops lost due to waterfowl depredation. Such a restructuring would allow for program enhancement in several areas. These areas are as follow:

1. The procedure would negate the necessity to reevaluate maximum allowable compensation limitations per acre;
2. The procedure would negate concern over inflationary pressures on production costs;
3. The procedure would substantially reduce the disparity in payments among farm operators;
4. The procedure would appeal to the majority of landowners; and
5. The procedure may give added direction to the placement of depredation prevention areas.

Changes of this nature readily follow once a decision is made as to the percentage of actual loss the wildlife damage fund should cover. This percent level could be assessed and remain unchanged. Further research is required, however, to assess the level of compensation which would serve societies best interest.

Regardless, any policy changes must reflect the disparity in lost revenue left unpaid among landowners if equal proportional compensation is to be adopted. Many landowners incur frequent losses due to waterfowl depredation overtime. There may be significant advantages for the compensation program to allow for periodic additional payments to landowners in this category or to ensure that adequate preventative measures are in place to reduce these losses.

Given the results of this thesis, adjustments to the compensation program alone are unlikely to solve the problem of declining waterfowl habitat. However, combining several programs to include compensation payments, prevention measures and other incentives attractive to landowners may be effective. Ryder and Boag (1981) suggest alterations to the Canadian land assessment regulations and the Canadian Income Tax Act which may ellicit positive responses on the part of landowners to retain wildlife habitat areas. In addition, programs described by Lees (1980) to reward landowners for wildlife habitat enhancement through public media has proven successful on a regionalized scale.

Programs of this sort, in conjunction with revised compensation and prevention measures may provide the diversity in options available to landowners that is required. Further research in these areas is required to assess the value of each suggestion to an overall habitat enhancement plan.

Finally, incorporating a plan to identify peculiarities in specific provincial regions may prove effective. Maintaining waterfowl habitat on a regional basis may be more manageable than assessing the value of individual habitat areas. In this instance, any reduction in habitat within a particular region must be offset with increased productive capacity within that same region to produce an overall balance. Regionalized plans should include a fine tuning of the compensation program and other incentives to landowners to retain or enhance waterfowl habitat if warranted.

Regardless, any policy changes must reflect the attitudes and perceptions of landowners and all resource users both now and in future generations. A primary obstacle to the success of any policy alteration are the engrained perceptions pervasive within society. Education and an understanding of the views of all affected parties must be an integral part of any policy program. Nonetheless, the primary objective must be to leave as many options open for future alterations in societies values of resource use patterns.

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VII. APPENDIX A

September 15, 1982

Mr. Casey Gluckman, Director
Division of Resource Management
Dept. of Natural Resources
Commonwealth Bldg.
Tallahassee, Florida
32303

Dear Mr. Gluckman,

I am currently involved in an M.Sc. thesis project entitled "An Economic Analysis of Agricultural Damage by Migrating Waterfowl in Alberta." Funding for the project is provided by the Alberta Fish and Wildlife Division. The project in part deals with waterfowl management practices and landowner compensation programs.

In order to assist in the analysis, knowledge of the practices and programs outside of Alberta would be most useful. Would you please send any information you can provide concerning the folowing:

1. The general nature and extent of crop depredation by waterfowl in your province or state;

2. Current practces employed to prevent crop depredation by waterfowl;

3. Current compensation programs in effect for affected landowners;

4. Attitudes of various interest groups concerning waterfowl damage to agricultural crops;

5. Any information concerning the relationship between crop depredation and habitat loss.

Your attention to these matters is greatly appreciated.

Yours sincerely,

Richard D. McConnell
Graduate Student

Table 1. Waterfowl Depredation and Control Programs in Canada by Province

Provinces	Species Type	Crops Affected	Prevention Practices	Compensation	Attitudes	Crop Depredation vs Habitat Loss
British Columbia	Ducks, geese, trumpeter swans	Swans - hay (winter) Ducks - grains Geese - corn (spring) - grains (fall) - pasture, veg. (winter)	Scare techniques, advice pamphlets, permit hunting, husbandry practices	None	Landowners want compensation. Hunters pay into federal fund from permits	A correlation in the Peace River Area
Manitoba	Ducks, geese, sandhill cranes	Grains - fall Geese and cranes - seedling and standing crops	Bait stations, lure crops, scare cannons, advice, scare permits (not permit hunting)	Existed since 1972. Fed/Prov cost sharing 50/50	Landowners feel duck populations should be decreased Differences between hunter attitudes (i.e. urban vs rural)	Positive correlation believed to exist
New Brunswick	No damage					
Newfoundland	Little agriculture, no damage					
Nova Scotia	No damage					
N.W.T.	Little agriculture, no damage					
Ontario (No Reply)						
P.E.I.	Geese	Spring - cereal crops Fall - field crops	Scare cannons, C.W.S. brochures on prevention	No gov't. program may be covered under standard insurance	Landowners becoming less tolerant	No relationship between crop depredation and habitat loss

Table 1 Continued

Provinces	Species Type	Crops Affected	Prevention Practices	Compensation	Attitudes	Crop Depredation vs Habitat Loss
Quebec	Geese	Spring - grasses may reduce pasture productivity and ability to develop grazing early in spring	Scare techniques, advice pamphlets and recommended cropping practices	None	Concern over increasing goose populations evident among farmers	Loosing habitat may increase depredation
Saskatchewan	Ducks, geese, sandhill cranes	Cereal grains	Bait stations - 21 in 2 areas in 1983 Lure crops - 5200 gov't. - 750-1500 purchase scare cannons - 900	Since 1972 fed/prov. 50/50	Farmers suggest gov't. responsible and should provide more compensation	Unknown
Yukon	Some geese mostly sandhill cranes	Little agriculture, damage minimal	Left up to individual landowners	None	Generally tolerant since wildlife important. However, tolerance may be diminishing among agricultural community	No relationship

Table 2. Waterfowl Depredation and Control Programs in the United States by State

State	Species Type	Crops Affected	Prevention Practices	Compensation	Attitudes	Crop Depredation vs Habitat Loss
Alabama	None Specified	Mostly on wildlife refuges; very little damage to private lands or crops	Discourage grain plantings near high concentrations of wintering waterfowl	None	Most landowners positive	Not known
Alaska	Ducks, geese, sandhill cranes	Minimal, some on barley in local areas	"Cracker Shells"; but little necessary	State does not accept liability for damage by wildlife	No significant attitudes developed for or against. Overshadowed by big game depredations (bison)	Little, if any
Arizona	Sandhill cranes	Minimal, young wheat or barley	Hunting practices, special depredation hunting permits	None	None specific to waterfowl depredation are significant	No relationship
Arkansas (No reply)						
California		Eliminated; was 1.75 M in 1943	Establish state and federal waterfowl areas, rice and barley	None	Not mentioned	Not mentioned
Colorado (No reply)						
Connecticut (No reply)						

Table 2 Continued

State	Species Type	Crops Affected	Prevention Practices	Compensation	Attitudes	Crop Depredation vs Habitat Loss
Deleware	Canada geese, swans	Winter wheat, cover crops. Uprooting of new sprouts - fall, not excessive	Scare techniques, scare crows, "cracker shells", reflective balloons, extended hunting season	None	Accepted damage, waterfowl hunting allows farmers to gain income	Crop depredation not related to habitat destruction. Crop changes in 1950's to winter wheat and corn established overwintering populations
Florida	Overwintering mallards and Canada geese	Little damage, grain production not extensive	No comment	None	No comment	No comment
Georgia	Initiated recent populations of Canada geese	No damages experienced to this point	None	None	No comment	No comment
Iowa	Canada geese	Corn, soybean	Fencing, scare devices such as cracker shells and scare crows. Bait stations, lure crops	None	Generally positive attitude towards goose populations from landowners, hunters, society in general	No comment
Indiana (No reply)						

Table 2 Continued

State	Species Type	Crops Affected	Prevention Practices	Compensation	Attitudes	Crop Depredation vs Habitat Loss
Illinois	Canada geese	Winter wheat planted in fall, minimal; 20 complaints per year	None specifically related to waterfowl	None	Generally no adverse attitudes	No information available
Idaho	Ducks, geese	Ducks - $360. Geese - $2900. 1981 - Total costs but no breakdown.	Herding, scare devices, fences, baiting, trapping and removal, lure crops, gov't. land purchase	None	Except for few landowners with recurring problems generally positive	No correlation between crop depredation and habitat loss
Kansas	Canada geese, snow geese	Very minimal, 2 complaints per year - winter wheat, corn harvested late	Scare evices (zon gunes) on persistent problem areas provided by gov't. agency	None, hope to work on prevention	Not a major issue	No connection
Kentucky		None, significant areas provided by gov't. and private clubs to attract waterfowl	None	None	Landowners and hunters interested in more waterfowl	Habitat losses dramatic in last two decades. No correlation with depredation stated. Efforts to obtain crop for waterfowl by hunting groups
Louisiana	Snow geese, teal, mottled ducks Most predominant from black birds	Ducks - rice Snow geese - Winter wheat Black birds - rice	No comment	No comment	No comment	No comment

Table 2 Continued

State	Species Type	Crops Affected	Prevention Practices	Compensation	Attitudes	Crop Depredation vs Habitat Loss
Maine	Eider duck	Cultured Mussels	None available to this point	None	No comment	No comment
Maryland	Canada geese, snow geese and whistling swans	Dormant winter wheat, cover crops of barley, rye and late spring corn. Extent unknown. 50-100 complaints per year	Equipment loan for scare techniques such as shell crackers, propane exploders, helium balloons, farm machinery, old kitchen appliances, etc. decoys in alert posture. Harvest periods for waterfowl	None. Many landowners receive monetary return for selling hunting rights	Considered significant problem by landowners	Loss of submerged aquatic grasses suggested to be a cause in increased depredations by whistling swan
Massachusettes	Canada geese	Corn, hay, rye, legumes, cranberry bogs. Cranberry destruction due to uprooting	Scare techniques, such as propane exploders, scare crows, black plastic bags. Hunting activity promoted to decrease damage	None	No information. General concensus of farmers for better solutions	No correlation between depredation and habitat loss
Michigan (No reply)						
Minnesota	No information compiled to this point					

Table 2 Continued

State	Species Type	Crops Affected	Prevention Practices	Compensation	Attitudes	Crop Depredation vs Habitat Loss
Mississippi (No reply)						
Missouri	Canada geese, snow geese	Winter wheat	Providing technical assistance, loan of scare equipment	None	In high density goose areas landowners may obtain enough revenue from hunting to offset damages. May also be used to damages and prevention practices	No comment
Montana	No comment	No comment; minimal	One lure crop program, scare guns, cracker shells	None	Not a significant area of conern	No relationship
Nebraska	Canada geese, mallard ducks	Geese winter wheat Mallards - corn and milo in fall due to late harvest	Scare device techniques	None, although under request	No information available	No information available
Nevada	Canada geese	Planted grain, alfalfa, golf courses	Lure crops on gov't. lands. Scare techniques	None	Pressure by farmers for compensation	Changing cropping practices may reduce habitat
New Hampshire	Geese	Field corn, very slight. 1 complaint in recent years	Propane exploder and cracker shells	None	No comment	No comment

Table 2 Continued

State	Species Type	Crops Affected	Prevention Practices	Compensation	Attitudes	Crop Depredation vs Habitat Loss
New Jersey	Canada geese, snow geese, whistling swan	Winter grain 1981 - 72,000 1982 - 200,000 Over utilizing of salt marsh habitat used by other species	Scare techniques, hunting activity	None	No comment	No comment
New Mexico	Snow geese, sandhill cranes	Geese - alfalfa (spring) Cranes - milo	Scare techniques, manipulation of hunting practices	No comment	Hunters and other groups generally sympathetic towards controlling waterfowl populations	Habitat loss may increase depredations. Most depredation occurs when habitat close to cropping areas
New York	Resident geese	Winter crops, wheat and rye	Scare techniques and advice	None	Not known	Not known. Much habitat loss has been deterred. Depredation increasing as goose populations increase
N. Carolina	Whistling swans, greater snow geese, Canada geese	Winter wheat, rye and barley. 1,000,000 annually	Scare devices, harassement, sport hunting	None	Varied. Tolerate to upset landowners. Hunters supportive of hunting season	No information, generally felt depredation affects landowner attitudes on maintaining habitat

Table 2 Continued

State	Species Type	Crops Affected	Prevention Practices	Compensation	Attitudes	Crop Depredation vs Habitat Loss
N. Dakota	No specific species	Swathed grain $250,000-1,000,000	Straight combining, grain drying, scare devices. However, scare devices no longer provided by government	None	Sporadic, but not considered an important issue	Habitat loss may increase depredations which in turn may change attitudes of landowners to further habitat removal
Ohio (No reply)						
Oklahoma (No reply)						
Oregon	Geese	Grain, grass crops	Scare devices	None	Nuisance for landowners	No information
Pennsylvania	Resident geese	Winter wheat minimal	Capture to release in South Carolina and Georgia for establishing populations. Scare devices	None	Landowners encouraging hunting and accepting responsibility for prevention	No comment
Rhode Island	Canada geese	Minimal, winter rye	Hunting season	None	No comment	No comment
S. Carolina	No damage					No relationship
S. Dakota (No reply)						

Table 2 Continued

State	Species Type	Crops Affected	Prevention Practices	Compensation	Attitudes	Crop Depredation vs Habitat Loss
Tennessee (No reply)						
Texas	Geese, sandhill cranes	Minimal, grains and legumes	Scare techniques such as flagging, propane exploders, legal hunting	None	Landowners gain income from hunting for part of damage season	Positive correlation between utilization of agriculture lands and habitat loss
Utah (No reply)						
Vermont	Canada geese	Newly seeded wheat, hay (spring)	Scare guns and crackers shells, hunting during fall migration	No comment	No comment	No comment
Virginia	Canada geese, snow geese, atlantic brant, whistling swan	Wheat, barley, rye. $145,000 annually. Whistling swan also damage oyster beds (65,000 -75,000 annually)	Hazing devices, visual repelling devices.	None	Landowners frustrated and not tolerant	Loss of habitat, aquatic vegetation, and changing cropping patterns are increasing depredation
Washington (No reply)						
West Virginia	Resident population of geese being developed	Very minimal	No comment	None	No comment	No comment

Table 2 Continued

State	Species Type	Crops Affected	Prevention Practices	Compensation	Attitudes	Crop Depredation vs Habitat Loss
Wisconsin	Geese, ducks, sandhill cranes	Primarly geese surrounding Horicon marsh	Propane exploder and flagging	Existed 1965-1980. Repealed, no compensation exists now. Annual average 5,000 paid	No comment	No comment
Wyoming	Canada geese, ducks, sandhill cranes	Corn, barley	Scare devices, lure crops	Presently exists	No comment	No comment

VIII. APPENDIX B

Table 3. Actual Losses From Waterfowl Damage to Crops in Alberta, 1964-1981

(Current Dollars)

Year	Number of Townships	Maximum Amount of Loss Per Township	Minimum Amount of Loss Per Township	Average Amount of Loss Per Township	Standard Deviation of Loss Per Township	Median Amount of Loss Per Township	Total Actual Loss in Alberta
1964	439	$ 12996	$ 27	$ 1268	$ 1682	$ 720	$556,562
1965	331	21974	53	2184	2657	1187	722853
1966	306	13928	78	1990	2153	1314	608983
1967	79	8574	77	964	1160	542	76137
1968	482	24319	72	2388	3071	1213	1150950
1969	487	27877	50	3239	3959	1756	2830998
1970	476	19466	50	2011	2459	1212	957022
1971	476	17596	65	1714	2099	1027	815855
1972	681	68889	46	4132	6772	2054	2814016
1973	730	71983	100	8397	10414	4643	6129543
1974	603	78191	120	5774	7516	3225	3481734
1975	511	41097	91	3992	5180	3287	2042391
1976	429	47252	116	3172	4638	1794	1360617
1977	910	49438	58	5348	6641	2924	4866183
1978	750	42098	138	4298	4870	2581	3223278
1979	457	3444	138	3265	4428	1728	1492101
1980	799	92614	124	4591	7036	2475	3668012
1981	260	51298	91	4426	5741	2590	1150652

Note: Actual loss amounts are derived by Alberta Hail and Crop Insurance personnel.

Table 4. Compensation Paid For Waterfowl Damage to Crops in Alberta, 1964-1981

(Current Dollars)

Year	Number of Townships	Maximum Comp. Paid Per Township	Minimum Comp. Paid Per Township	Average Comp. Paid Per Township	Standard Deviation of Comp. Paid Per Township	Median Comp. Paid Per Township	Total Comp. Paid in Alberta
1964	439	$ 6499	$ 14	$ 740	$ 906	$ 420	$324987
1965	331	5569	18	640	771	354	211799
1966	306	4055	26	522	520	360	159611
1967	79	3628	28	357	466	194	28238
1968	482	7469	20	804	975	431	387408
1969	487	10724	16	1091	1291	613	953874
1970	476	6271	22	656	742	406	312445
1971	476	6017	30	679	811	416	323431
1972	681	14615	14	595	1346	488	609159
1973	730	12139	39	1375	1615	819	1004069
1974	603	18257	38	1325	1640	787	799056
1975	511	11499	27	1005	1346	563	541335
1976	429	11340	50	881	1251	525	377939
1977	910	14869	10	1697	2111	902	1544452
1978	750	11728	10	1574	1824	928	1180725
1979	457	15445	87	1794	2213	1011	819798
1980	799	34035	42	2158	3057	1215	1724278
1981	260	16806	30	1722	2037	1058	447740

Comp. = Compensation

Table 5. Compensation Paid, Actual Loss and Crop Prices in Alberta by Year and by Category, 1964-1981 (Current Dollars)

Category	Maximum Compensation Paid	Maximum Actual Loss	Average Compensation Paid	Average Actual Loss	Number of Townships	Annual Average Crop Prices				
						Wheat	Barley	Oats	Mixed	Other
Category 1										
1964	$ 6499	$ 12996	$ 740	$ 1268	439	$ 1.78	$ 1.18	$ .73	$ .96	
1965	5569	21974	640	2184	331	1.88	1.19	.80	1.00	
1966	4055	13928	522	1990	306	1.91	1.20	.79	1.00	
1967	3628	8574	357	964	79	1.76	1.00	.77	.89	
1968	7469	24319	804	2388	482	1.62	.97	.60	.84	
1969	10724	27877	1091	3239	874	1.57	.83	.64	.74	
1970	6271	19466	656	2010	476	1.60	.91	.63	.77	
1971	6017	17596	679	1714	476	1.53	.81	.63	.72	
1972	14615	68889	895	4132	681	2.11	1.46	1.05	1.25	
Total	64847	215619	6384	19889	5781	15.76	9.55	6.01	8.17	
Average	7205	23958	709	2210	642	1.75	1.06	.67	.91	
Category 2										
1973	12139	71983	1375	8397	730	4.50	2.59	1.91	2.15	
1974	18257	78191	1325	5774	603	4.30	2.33	1.65	1.99	
1975	11499	41097	1005	3991	511	3.84	2.26	1.62	1.94	
1976	11340	47252	881	3172	429	2.99	1.99	1.29	1.64	
1977	14869	49438	1697	5348	910	2.93	1.76	1.14	1.45	

Table 5 Continued

Category	Maximum Compensation Paid	Maximum Actual Loss	Average Compensation Paid	Average Actual Loss	Number of Townships	Annual Average Crop Prices				
						Wheat	Barley	Oats	Mixed	Other
Category 2 (cont')										
Total	64105	287961	6283	26682	3183	18.56	10.93	7.41	9.17	
Average	13621	57592	1257	5336	637	3.71	2.19	1.48	1.83	
Category 3										
1978	11728	42098	1574	4298	750	3.00	1.80	1.15	1.60	
1979	15445	34444	1794	3265	457	3.00	1.80	1.15	1.81	
1980	34035	92614	2158	4591	799	3.55	1.97	1.25	1.60	s 1.66
1981	16806	51298	1722	4426	260	3.82	2.40	1.40	1.80	1.80
Total	78014	220454	7248	16580	2266	13.37	7.97	4.95	6.81	3.46
Average	19504	55114	1812	4145	567	3.34	1.99	1.24	1.70	1.73

Note: Categories 1, 2 and 3 are defined on the basis of maximum per acre payment limitations throughout the history of the compensation program in Alberta.

Table 6. Canadian Consumer Price Index (All Items) and Conversion Factors for Compensation and Loss Values, 1964-1981

Year	Consumer Price Index (1971 = 100)	Conversion Factor (1981 = 100)
1964	78.6	.3318
1965	80.5	.3398
1966	83.5	.3525
1967	86.5	.3651
1968	90.0	.3799
1969	94.1	.3972
1970	97.2	.4103
1971	100.0	.4221
1972	104.8	.4424
1973	112.7	.4757
1974	125.0	.5276
1975	138.5	.5846
1976	148.9	.6285
1977	160.8	.6788
1978	175.2	.7396
1979	191.2	.8071
1980	210.6	.8890
1981	236.9	1.0000

Source: Statistics Canada.

Table 7. Actual Losses from Waterfowl Damage to Crops in Alberta, 1964-81

(1981 Dollars)

Year	Number of Townships	Maximum Amount of Loss Per Township	Minimum Amount of Loss Per Township	Average Amount of Loss Per Township	Standard Deviation of Loss Per Township	Median Amount If Loss Per Township	Total Actual Loss in Alberta
1964	439	$ 39171	$ 81	$ 3821	$ 5071	$ 2170	$1677508
1965	331	64667	156	6427	7819	3493	2127283
1966	306	39512	221	5646	6106	3728	1727609
1967	79	23484	211	2640	3177	1485	208541
1968	482	64014	190	6286	8084	3193	3029605
1969	487	70184	126	8155	9968	4420	7127400
1970	476	47443	122	4900	5994	2953	2332489
1971	476	41687	154	4061	4972	2433	1932852
1972	681	155717	104	9340	15307	4643.	6360793
1973	730	151320	210	17651	21891	9760	12885310
1974	603	148201	227	10944	14245	6113	6599192
1975	511	70299	156	6828	8861	3700	3493747
1976	429	75182	185	5047	7379	2854	2165205
1977	910	72832	85	7878	9783	4038	7169407
1978	750	56920	187	5811	6585	3490	4358135
1979	457	42676	171	4045	5486	2141	1848718
1980	799	104178	139	5164	7914	2784	4126170
1981	799	51298	91	4426	5741	2590	1150652

Table 8. Compensation Paid for Waterfowl Damage to Crops in Alberta, 1964-1981 (1981 Dollars)

Year	Number of Townships	Maximum Comp. Per Township	Minimum Comp. Per Township	Average Comp. Per Township	Standard Deviation Comp. Per Township	Median Comp. Per Township	Total Comp. Paid in Alberta
1964	439	$ 19588	$ 42	$ 2231	$ 2732	$ 1266	$979520
1965	331	16389	53	1889	2667	1042	623310
1966	306	11504	74	1480	1475	1021	452793
1967	79	9937	77	979	1276	531	77342
1968	482	19660	53	2115	2566	1135	1019758
1969	487	26999	40	2748	3251	1542	2401497
1970	476	15284	54	1600	1810	989	761504
1971	476	14255	71	1610	1921	984	766237
1972	681	33036	32	2022	3043	1103	1376950
1973	730	25518	82	2891	3395	1722	2110744
1974	603	34604	72	2512	3109	1492	1514525
1975	511	19670	46	1719	2302	963	879817
1976	429	18043	80	1402	1990	835	601341
1977	910	21905	15	2500	3110	1329	2275269
1978	750	15857	14	2129	2466	1255	1596448
1979	457	19136	108	2223	2741	1253	1015750
1980	799	38285	47	2428	3439	1367	1939578
1981	260	16806	30	1722	2037	1058	447740

Comp. = Compensation.

Table 9. Compensation Paid, Actual Loss and Crop Prices in Alberta by Year and by Category, 1964-1981 (1981 Dollars)

Category	Maximum Compensation Paid	Maximum Actual Loss	Average Compensation Paid	Average Actual Loss	Number of Townships	Annual Average Crop Prices				
						Wheat	Barley	Oats	Mixed	Other
Category 1										
1964	$ 19588	$ 39171	$ 2231	$ 3821	439	$ 5.36	$ 3.56	$ 2.20	$ 2.89	
1965	16389	64667	1889	6427	331	5.53	3.50	2.35	2.94	
1966	11504	39512	1480	5646	306	5.42	3.40	2.24	2.84	
1967	9937	23484	979	2640	79	4.82	2.74	2.11	2.44	
1968	19660	64014	2116	6286	482	4.26	2.55	1.58	2.21	
1969	26999	70184	2748	8155	874	3.95	2.09	1.61	1.86	
1970	15284	47443	1600	4900	476	3.90	2.22	1.54	1.88	
1971	14255	41687	1610	4061	476	3.62	1.92	1.49	2.37	
1972	33036	155717	2022	9340	681	4.77	3.30	2.37	2.83	
Total	166652	545879	16675	51276	5781	41.63	25.28	17.49	22.26	
Average	18517	60653	1853	5697	6423	4.63	2.81	1.94	2.47	
Category 2										
1973	25518	151320	2891	1765	730	9.46	5.45	3.59	4.52	
1974	34604	148201	2512	10944	603	8.15	4.42	3.13	3.77	
1975	19670	70299	1719	6828	511	6.57	3.87	2.77	3.32	
1976	18043	75182	1402	5047	429	4.76	3.17	2.05	2.61	
1977	21905	72832	2500	7878	910	2.60	2.59	1.68	2.14	

Table 9 Continued

Category	Maximum Compensation Paid	Maximum Actual Loss	Average Compensation Paid	Average Actual Loss	Number of Townships	Annual Average Crop Prices				
						Wheat	Barley	Oats	Mixed	Other
Cateogry 2 (cont')										
Total	119740	517834	11024	32462	3183	41.00	19.50	13.22	13.75	
Average	23948	103567	2205	6492	636.7	8.20	3.90	2.64	2.75	
Category 3										
1978	15857	56920	2129	5811	750	4.06	2.43	1.55	2.16	
1979	19136	42676	2223	4045	457	3.72	2.23	1.42	2.24	
1980	38285	104178	3428	5164	799	3.99	2.22	1.41	1.80	1.87
1981	16806	51298	1722	4426	260	3.82	2.40	1.40	1.80	1.80
Total	90084	255072	8502	19446	2266	15.59	9.28	5.78	8.00	3.67
Average	22521	63678	2126	4862	566.5	3.90	2.32	1.45	2.00	1.84

Table 10. Actual Loss / Compensation Paid Ratios (AL / CP) By Year, 1964-1981

Year	Maximum AL / CP Ratio	Minimum AL / CP Ratio	Mean Al / CP Ratio	Standard Deviation of AL / CP Ratio
1964	4.00	0.18	1.69	0.43
1965	6.34	1.33	3.42	0.71
1966	6.57	1.34	3.75	0.97
1967	4.67	1.35	2.79	0.59
1968	18.70	1.54	2.98	1.07
1969	6.60	.74	2.91	0.79
1970	32.14	0.89	3.04	1.54
1971	6.65	0.96	2.56	0.66
1972	12.21	1.25	4.49	1.14
1973	10.80	0.68	5.84	1.86
1974	105.62	1.20	4.44	4.34
1975	12.95	1.38	4.18	1.37
1976	19.40	1.20	3.64	1.30
1977	107.47	0.77	3.41	3.67
1978	27.00	2.00	3.24	2.63
1979	5.09	0.60	1.79	0.49
1980	5.66	1.32	2.12	0.65
1981	5.74	1.33	2.57	0.80

Table 11. Regression Results of Crop Damage Compensation as a Function of Actual Loss in Alberta, 1964-1981 (1981 Dollars)

Year	Number of Observations	Constant	Slope Coefficient	Standard Error of Coefficient	F Statistic	Correlation Coefficient	Explained Variation	Mean of the Estimate	Standard Error of the Estimate	Durbin-Watson Statistic
1964	439	217.82	0.53	0.005	9562.71	0.98	95.63%	$2231	$ 572	1.77
1965	331	58.36	0.28	0.003	7484.47	0.98	95.79%	1883	466	1.86
1966	331	58.36	0.28	0.004	2635.40	0.95	89.66%	1480	475	1.62
1967	79	-66.49	0.40	0.007	2821.92	0.99	97.34%	979	209	1.92
1968	482	185.28	0.31	0.004	7060.12	0.97	93.63%	2116	648	1.49
1969	874	172.44	0.32	0.003	13063.66	0.97	93.74%	2748	814	1.52
1970	476	164.51	0.29	0.003	7608.26	0.97	94.14%	1600	439	1.74
1971	476	87.09	0.37	0.004	7693.41	0.97	94.20%	1610	463	1.73
1972	681	199.74	0.20	0.001	17841.66	0.98	96.33%	2022	583	1.56
1973	730	229.41	0.15	0.001	12653.56	0.97	94.56%	2891	792	1.81
1974	603	222.56	0.21	0.003	6751.82	0.96	91.83%	2512	890	1.68
1975	512	22.85	0.25	0.003	5464.21	0.95	91.46%	1718	673	1.35
1976	429	84.22	0.26	0.003	6298.43	0.97	93.65%	1402	502	1.81
1977	910	124.79	0.30	0.003	8156.24	0.95	89.98%	2500	985	1.35
1978	750	50.71	0.36	0.004	7748.93	0.95	91.20%	2129	732	1.48
1979	457	286.71	0.48	0.007	5040.32	0.96	91.72%	2223	790	1.58
1980	799	283.00	0.42	0.008	8387.68	0.96	91.32%	2428	1014	1.66
1981	260	242.35	0.33	0.007	2047.67	0.94	88.81%	1722	683	1.79

Table 12. Total Compensation Paid by Number of Claimed Years, 1964-1981 (1981 Dollars)

Number of Claimed Years	Number of Townships Claiming Damages	Total Compensation Paid	Mean	Range	Percentage of Total Compensation Paid	Percentage of Total Townships Claiming Damages
18	1	$ 64,113	$ 64,113	$ 0	3.07	0.05
17	3	392,534	130,844	92,016	1.88	0.14
16	8	156,471	82,058	75,557	3.14	0.38
15	8	382,835	47,854	71,611	1.80	0.38
14	25	1,149,197	45,967	76,511	5.50	1.19
13	27	1,085,524	40,204	61,106	5.21	1.28
12	45	1,588,150	35,292	73,997	7.62	2.14
11	58	1,825,654	31,476	145,733	8.76	2.76
10	67	1,723,148	25,718	66,588	8.27	3.18
9	82	1,497,388	18,260	40,041	7.18	3.89
8	99	1,824,197	18,426	48,129	8.75	4.70
7	121	1,699,802	14,047	57,193	8.15	5.75
6	150	1,888,130	12,587	54,736	9.05	7.13
5	167	1,347,207	8,067	32,397	6.46	7.93
4	197	1,177,437	5,976	20,944	5.65	9.36
3	236	1,080,476	4,578	29,081	5.18	11.21
2	321	865,084	2,694	19,344	4.15	15.25
1	483	596,276	1,234	38,253	2.86	22.90
Total	2105	20,483,623	589,395	1,003,237	99.97	99.65
Average	117	1,157,979	32,744	55,735	5.55	5.54

Table 13. Total Number of Applications for Water Use Permits by Year, 1964-1981

Year	Number of Applications	Relative Frequency	Cumulative Frequency
1964	24	1.9	1.9
1965	22	1.7	3.6
1966	38	3.0	6.6
1967	36	2.8	9.4
1968	49	3.8	13.2
1969	29	2.3	15.5
1970	25	2.0	17.4
1971	51	4.0	21.4
1972	40	3.1	24.6
1973	54	4.2	28.8
1974	83	6.5	35.3
1975	106	8.3	43.6
1976	81	6.3	49.9
1977	138	10.8	60.7
1978	94	7.4	68.1
1979	120	9.4	77.5
1980	124	9.8	87.2
1981	163	12.8	100.0
Total	1277	100.0	

Table 14. Total Number of Townships by Frequency of Water Use Applications Per Township 1964-1981

Frequency of Applications Per Township	Number of Townships	Relative Frequency	Cumulative Frequency
1	501	63.90	63.90
2	177	22.60	86.50
3	67	8.50	95.00
4	13	1.70	96.70
5	14	1.80	98.50
6	4	0.50	99.00
7	2	0.29	99.29
8	2	0.29	99.58
9	0	0.00	99.58
10	0	0.00	99.58
11	0	0.00	99.58
12	0	0.00	99.58
13	0	0.00	99.58
14	2	0.29	99.87
15	0	0.00	99.87
16	1	0.13	100.00
Total	783	100.00	

Table 15. Number of Water Use Applications by Stated Purpose, 1964-1981

Stated Purpose	Number of Applications	Relative Frequency	Cumulative Frequency
Diversion	842	65.9	65.9
Other	146	11.4	77.4
Storage	289	22.6	100.0
Total	1277	100.0	

Table 16. Number of Water Use Applications by Applicant Name, 1964-1981

Applicant Name	Number of Applications	Relative Frequency	Cumulative Frequency
Private Company	182	14.2	14.2
Ducks Unlimited (Canada)	281	22.0	36.2
Government	565	44.2	80.4
Private Individual	249	19.6	100.0
Total	1277	100.0	

Table 17. Number of Water Use Applications by Source of Supply, 1964-1981

Source of Supply	Number of Applications	Relative Frequency	Cumulative Frequency
Aquifer	40	3.1	3.1
Canal	2	0.2	3.3
Coulee	312	24.4	27.7
Creek	221	17.4	45.1
Lake	86	6.7	51.8
River	91	7.1	58.9
Runoff	383	30.0	88.9
Slough	132	10.3	99.2
Spring	2	0.2	99.4
Stream	3	0.2	99.6
St. Wa.	5	0.4	100.0
Total	1277	100.0	

Table 18. Water Use Diversion Projects by Applicant Name, 1964-1981

Year	Private Company	Government	Private Individuals	Ducks Unlimited
1964	0	8	2	0
1965	0	12	2	0
1966	0	20	1	0
1967	0	16	3	0
1968	0	24	5	0
1969	1	8	3	0
1970	0	2	1	0
1971	1	13	2	1
1972	2	10	0	0
1973	3	27	3	0
1974	11	42	14	0
1975	12	38	34	0
1976	14	30	25	0
1977	27	34	43	0
1978	12	35	21	0
1979	14	55	14	0
1980	22	36	20	0
1981	33	50	36	0
Total	152	460	229	1

Note: Government includes both municipalities and provincial departments.

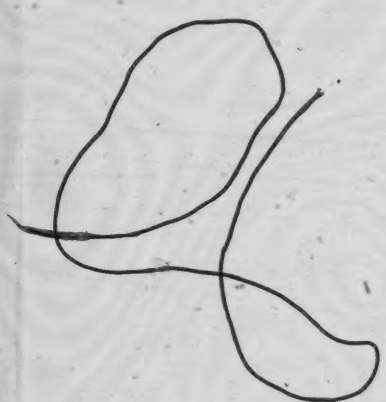


Table 19. Water Storage Projects by Applicant Name, 1964-1981

Year	Private Company	Government	Private Individuals	Ducks Unlimited
1964	0	1	0	0
1965	0	0	0	2
1966	0	0	0	1
1967	0	0	0	0
1968	0	1	1	3
1969	0	2	1	2
1970	0	1	0	3
1971	0	2	1	1
1972	2	4	0	20
1973	2	6	2	8
1974	2	12	0	2
1975	3	11	0	7
1976	0	7	1	3
1977	3	17	2	11
1978	0	3	2	20
1979	4	3	2	25
1980	1	5	1	38
1981	1	6	1	30
Total	18	81	14	176

Note: Government includes municipalities and provincial departments.

Table 20. Other Water Use Projects by Applicant Name, 1964-1981

Year	Private Company	Government	Private Individuals	Ducks Unlimited
1964	0	2	1	10
1965	1	1	0	4
1966	0	0	1	15
1967	1	0	0	16
1968	1	0	1	13
1969	0	0	0	12
1970	0	1	0	17
1971	3	10	1	16
1972	1	1	0	0
1973	0	2	0	1
1974	0	0	0	0
1975	1	0	0	0
1976	0	0	1	0
1977	0	1	0	0
1978	0	0	1	0
1979	0	3	0	0
1980	0	1	0	0
1981	4	2	0	0
Total	12	24	6	104

Note: Government includes municipalities and provincial departments.

IX. APPENDIX C

Table 21. Weighted Average of Compensation Paid and Actual Loss by Category, Alberta, 1964-81 (Current Dollars)

Year	Average Compensation Paid (Col. 1)	Average Total Loss (Col. 2)	Number of Townships (Col. 3)	Total Compensation Paid (Col. 1 x Col. 3)	Total Loss (Col. 2 x Col. 3)
Category 1					
1964	740	1,268	439	324,860	556,652
1965	640	2,184	331	211,840	722,904
1966	522	1,990	306	159,732	608,940
1967	357	964	79	28,203	76,156
1968	804	2,388	482	387,528	1,151,016
1969	1,091	3,239	874	953,534	2,830,886
1970	656	2,010	476	312,256	956,760
1971	679	1,714	476	323,204	815,864
1972	895	4,132	681	609,495	2,813,892
Total for 1964-72			5,781	3,310,652	10,533,070
Weighted average	573	1,.228			
Category 2					
1973	1,375	8,397	730	1,003,750	6,129,810
1974	1,325	5,774	603	798,975	3,481,722
1975	1,005	3,991	511	513,555	2,039,401
1976	881	3,172	429	377,949	1,360,788
1977	1,697	5,348	910	1,544,270	4,866,680
Total for 1973-77			3,183	4,238,499	17,878,401
Weighted average	1,332	5,617			
Category 3					
1978	1,574	4,298	750	1,180,500	3,223,500
1979	1,794	3,265	457	819,858	1,492,105
1980	2,158	4,591	799	1,724,242	3,668,209
1981	1,722	4,426	260	447,720	1,150,760
Total for 1978-81			2,266	4,172,320	9,534,574
Weighted average	1,841	4,208			

Table 22. Weighted Average of Compensation Paid and Actual Loss by Category, Alberta, 1964-81 (1981 Dollars)

Year	Average Compensation Paid (Col. 1)	Average Total Loss (Col. 2)	Number of Townships (Col. 3)	Total Compensation Paid (Col. 1 x Col. 3)	Total Loss (Col. 2 x Col. 3)
Category 1					
1964	2,231	3,821	439	979,409	1,677,419
1965	1,889	6,427	331	625,259	2,127,337
1966	1,480	5,646	306	452,880	1,727,676
1967	979	2,640	79	77,341	208,560
1968	2,116	6,286	482	1,019,912	3,029,852
1969	2,748	8,155	874	2,401,752	7,127,470
1970	1,600	4,900	476	761,600	2,332,400
1971	1,610	4,061	476	766,360	1,933,036
1972	2,022	9,340	681	1,376,982	6,360,540
Total for 1964-72			5,781	8,461,495	26,524,290
Weighted average	1,464	4,588			
Category 2					
1973	2,891	1,765	730	2,110,430	1,288,450
1974	2,512	10,944	603	1,514,736	6,599,232
1975	1,719	6,828	511	878,409	3,489,108
1976	1,402	5,047	429	601,458	2,165,163
1977	2,500	7,878	910	2,275,000	7,168,980
Total for 1973-77			3,183	7,380,033	20,710,933
Weighted average	2,319	6,507			
Category 3					
1978	2,129	5,811	750	1,596,750	4,358,250
1979	2,223	4,045	457	1,015,911	1,848,565
1980	2,428	5,164	799	1,939,972	4,126,036
1981	1,722	4,426	260	447,720	1,150,760
Total for 1978-81			2,266	5,000,353	11,483,881
Weighted average	2,207	5,068			

X. APPENDIX D

Table 23. Description and Publication Year of Maps Used for Landowner Selection

Map Description	Year of Most Recent Publication
Municipal District 9	1982
Municipal District 14	1980
Improvement District 1	1983
Municipal District 31	1975
Speical Area 2	1983
County 23	1983
Special Area 4	1983
County 24	1983
County 10	1978
County 27	1978
County 20	1982
County 19	1981
County 21	1982
County 30	1981
County 13	1982
Municipal District 87	1982
County 17	1982
County 28	1980
County 11	1982
Municipal District 92	1979
Improvement District 17	1983
Municipal District 130	1982
Improvement District 19	1983
Municipal District 135	1982

123	124	127	128	131	132	135	136	139	140	143	144
122	121	126	125	130	129	134	133	138	137	142	141
119	120	115	116	111	112	107	108	103	104	99	100
118	117	114	113	110	109	106	105	102	101	98	97
75	76	79	80	83	84	87	88	91	92	95	96
74	73	78	77	82	81	86	85	90	89	94	93
71	72	67	68	63	64	59	60	55	56	51	52
70	69	66	65	62	61	58	57	54	53	50	49
27	28	31	32	35	36	39	40	43	44	47	48
26	25	30	29	34	33	38	37	42	41	46	45
23	24	19	20	15	16	11	12	7	8	3	4
22	21	18	17	14	13	10	9	6	5	2	1

Figure 6. Example of Numerical Ordering of Quarter Sections Within Each Township

Table 24. Number of Landowner Pacticipants Per Township by Category

Township	Claimant	Non-Claimant
4-08-30	1	5
4-11-15	1	2
4-12-04	1	6
4-20-28	3	8
4-33-11	2	1
4-35-25	3	4
4-36-03	1	4
4-46-01	5	5
4-46-25	3	3
4-47-02	3	4
4-52-06	4	6
4-52-15	3	2
4-54-21	3	2
4-55-07	4	3
4-57-07	1	5
4-57-16	5	2
4-58-13	5	5
4-60-04	1	5
5-31-02	3	7
5-33-02	3	7
5-46-02	2	4
5-54-04	1	6
5-59-05	4	3
5-64-02	1	4
5-69-01	1	2
5-76-19	3	3
5-79-21	3	-
9-79-25	3	1

Table 24. Continued

Township	Claimant	Non-Claimant
5-83-23	3	4
5-83-24	2	1
	78	114

XI. APPENDIX E

November 18, 1983

Mr. Dale Engleson
Box 2035
Taber, Alberta
T0K 2G0

Dear Mr. Engleson:

I am sending you a copy of the questionnaire we talked about earlier. You will also find enclosed a stamped, addressed envelope to return the questionnaire. Should you have any problem or questions feel free to call me COLLECT at 454-3256.

Several questions in the questionnaire are to be answered using a scale. This approach may be unfamiliar to you so I will give you a brief example which may help.

Question 7 in the questionnaire uses a series of scales from 1 to 5 to allow you to describe the wildlife existing within the boundaries of your farm. For example, if you have seen a lot of pheasants or partridge on your farm, you would circle No. 5 in the line for upland birds. If you have not seen any deer, moose or elk you would not circle any numbers on the line for big game. If you wish to mention some wildlife specifically, write it on the line provided under the heading Other. Then choose the number on the scale which best describes how often you see that particular type of wildlife on your land.

Your answer to question 7 may look similar to:

	Scale				
	Rarely Seen				Often Seen
Big Game (incl. deer, moose, elk, bear)	1	2	3	4	5
Upland Birds (incl. pheasants, partridge, grouse)	1	2	3	4	**(5)**
Ducks	1	2	3	4	5
Geese	1	2	3	4	5
Other (specify) Coyotes	1	2	**(3)**	4	5

I hope this explanation will help you. If possible, please return your answers within a week of receiving the questionnaire. This should help to avoid the Christmas mailing season.

I appreciate your participation in this survey and look forward to receiving your answers. Thanks once again for your help.

Sincerely,

Richard McConnell
Graduate Student

Confidential

Private Land Wildlife Use Survey

Section A

1. Name: _____

2. Address: _____
_____
_____
_____

3. Number of years farming: _____ years

4. Where was the majority of your youth spent?
_____ Rural Area (less than 1,000 population)
_____ Town (1,000 to 10,000 population)
_____ City (over 10,000 population)

Confidential

Section B

5. What crops are you presently growing on the land within your operation? **Please indicate crops in acres** which apply to your operation.

	Privately Owned	Rented (from private individual)	Government Leased	Total
Wheat				
Oats				
Barley				
Rapeseed				
Flax				
Other Crops				
Tame Pasture				
Fallow				
Native Pasture				
Other Land				

6. What percentage of the various crops you grow go towards sale, feed and seed?

	Sale	Feed (for your own operation)	Seed (for your own operation)
Wheat	____%	____%	____%
Oats	____%	____%	____%
Barley	____%	____%	____%
Rapeseed	____%	____%	____%
Flax	____%	____%	____%
Other (crop)	____%	____%	____%

Section C

7. Using the scale from 1 to 5 provided, please indicate the types of wildlife which exist within the boundaries of your farming operation?

	Scale				
	Rarely Seen				Often Seen
Big Game (incl. deer, moose, elk, bear)	1	2	3	4	5
Upland Birds (incl. pheasants, partridge, grouse)	1	2	3	4	5
Ducks	1	2	3	4	5
Geese	1	2	3	4	5
Other (specify) _____	1	2	3	4	5

8. Do you consider any land within your farm operation to be suitable for wildlife habitat?

Yes _____ No _____ If "yes", please complete the following table.

Wildlife Group (as in question 7)	Land Description (eg. slough, bush)	Area Size (Acres)	Nearest Crop Grown in Vicinity (this year)
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

9. Have you ever suffered crop or livestock damage from wildlife?

Yes _____ No _____ If "yes", please indicate the crop or livestock affected, the type of wildlife causing damage and using the scale from 1 to 5 describe how often the damage to each crop affected occurs.

Crop / Livestock Affected	Type of Wildlife Causing Damage	Scale				
		Rare				Quite Often
i) _____	_____	1	2	3	4	5
ii) _____	_____	1	2	3	4	5

10. Are you aware of any programs which provides some form of compensation or assistance in preventing crop damage by wildlife?

Yes _____ No _____ If "yes", please specify:

i) _____

ii) _____

11. Have you ever applied to, or requested assistance from, any of the programs you mentioned in question 10?

Yes _____ No _____ If "yes", please complete the following:

Program Under Which Request Was Made	Crop Affected	Wildlife Causing Damage	How Was The Request Made (eg. writing, verbal, etc.)
i) _____	_____	_____	_____
ii) _____	_____	_____	_____

12. Using the scale from 1 to 5 provided, please rate your satisfaction to any compensation program or assistance you received in preventing crop / livestock damage by wildlife.

Program	Rating Scale Poor				Excellent
i) _____	1	2	3	4	5
ii) _____	1	2	3	4	5

Why was this rating given? i) _____

_____

Why was this rating given? ii) _____

_____

13. a. Have you ever made adjustments to your farm operation due to crop / livestock damages by wildlife?

Yes _____ No _____

b. If you answered "yes" to question 13 a), please describe the change or changes you made and using the scale from 1 to 5 provided, indicate how each change affected the damages due to wildlife?

Changes to Decrease Crop / Livestock Damage	Damage Scale No Change				Significant Change
i) _____	1	2	3	4	5
_____					
ii) _____	1	2	3	4	5
_____					

c. What are your **estimated** costs for the changes you made to decrease crop / livestock damage due to wildlife mentioned in question 13 b)?

1st change mentioned in question 13 b) $ _____.00

2nd change mentioned in question 13 b) $ _____.00

14. a. Have you ever made adjustments to your farm operation which would benefit wildlife?

Yes _____ No _____

b. If you answered "yes" to question 14 a), please describe the change or changes you made and using the scale from 1 to 5 provided, indicate how each change affected the wildlife in your area.

Changes to Benefit Wildlife	Wildlife Scale: No Increase				Significant Increase
i) _____	1	2	3	4	5
_____					
ii) _____	1	2	3	4	5
_____					

c. What are your estimated costs for the changes you made to benefit wildlife mentioned in question 14 b)?

Cost for first change mentioned in question 14 b)? $ _____.00

Cost for second change mentioned in question 14 b)? $ _____.00

15. a. Have you ever applied to the Water Resources Branch for either water storage or water drainage permits?

Storage	Drainage
Yes ___ No ___	Yes ___ No ___

b. Were these requests granted?

Storage	Drainage
Yes ___ No ___	Yes ___ No ___

16. a. Have you ever taken action on your own to prevent wildlife damages?

Yes ___ No ___

b. If "yes", please specify and indicate **approximate** annual costs.

Action Taken	Annual Cost
i) _____	$ _____.00
_____	
ii) _____	$ _____.00
_____	

Section D

17. Do you feel a farmer should accept some crop damage from wildlife as a normal expense in the farm operation?

    Yes _____ No _____

18. Do you believe the frequency of crop / livestock damage from wildlife (persistent annual damage) would change your answer to question 17?

    Yes _____ No _____ Please explain.

    _____

    _____

19. a. Do you feel a farmer should be compensated for crop / livestock damage by wildlife?

    Yes _____ No _____

    If "yes", compensation should be paid on the basis of (check one)

    _____ Production costs - cash outlay (costs incurred in planting, etc.)

    _____ Market value of crop lost

    _____ Other (please specify) _____

    b. What percentage of the compensation basis indicated above should be paid?

    Percentage _____% (0 to 100%)

20. Should the **percentage** of compensation paid vary depending on the crop affected or the wildlife species causing the damage problem?

    Yes _____ No _____

    Please explain _____

    _____

21. Using the following list, please indicate where the funding for compensation programs for crop / livestock damages should come. **Check only** those sources you feel should contribute and indicate the percentage of contribution towards the total.

	Check	Percentage Contribution

Federal Government	___	____%
Hunters	___	____%
Landowner Insurance	___	____%
Provincial Government	___	____%
Other source (please specify) _____	___	____%
		Total 100%

22. Are you contemplating any future changes to your operation as a result of recent crop / livestock damages from wildlife?

Yes _____ No _____ If "yes", please describe the change(s) and the **approximate** amount you would be willing to pay to undertake these change(s).

Change(s)	Amount
1. _____	$ _____.00
_____	
2. _____	$ _____.00
_____	

Section E

23. Are you or any members of your family hunters?

Yes _____ No _____

24. Do you hunt primarily on your own land?

Yes _____ No _____

25. Are you aware of any lure crop, bait stations, feeding areas, wildlife sanctuaries etc. in your immediate area?

Yes _____ No _____ If "yes", do the lure crops, bait stations, feeding areas, wildlife sanctuaries in your area affect either:

a. Your hunting _____

b. Wildlife damage to your crops or livestock _____

26. Do you allow hunting access to your land by other individuals?

Yes _____ No _____

If "no", why not _____

_____

If "yes", how would you rate the extent of hunting use and the courtesy of individuals allowed access?

No. of individuals / year _____ individuals

Comments on courtesy of hunters _____

_____

_____

_____

27. Any further comments you have related to wildlife, crop/livestock damages or this questionnaire would be greatly appreciated.

Comments: _____

Thank you for your information.

Please Return to:

Rural Economy
Faculty of Agriculture and Forestry
University of Alberta
Edmonton, Alberta
T6G 9Z9

XII. APPENDIX F

Table 25. Number of Landowners by Farming Experience

Experience (Years)	Number of Landowners	Percent	Cumulative Percent
1 - 10	18	15.4	15.4
11 - 20	26	22.5	37.9
21 - 30	27	23.0	60.9
31 - 40	27	23.0	83.9
41 - 50	13	11.1	95.0
51 - 60	2	1.7	96.7
61 - 70	1	0.8	97.5
over 70	1	0.8	98.3
No Response	2	1.7	100.0
	117	100.0	

Table 26. Landowner Youth History by Location Description

Location Description	Number of Landowners	Percent	Cumulative Percent
Rural Area	106	90.6	90.6
Town	8	6.8	97.4
City	3	2.6	100.0
	117	100.0	

NOTE: Rural Area (Population less than 1,000)

Town (Population between 1,000 and 10,000)

City (Population over 10,000)

Table 27. Farm Land Use Patterns by Size

Acre Size	Total Land in Cereal Grain	Percent	Total Land in Other Crops	Percent
1 - 160	20	15	20	18
161 - 640	63	60	54	50
641 - 1000	14	13	14	13
1001 - 2000	7	7	12	11
2001 - 5000	1	1	5	5
over 5000	-	-	4	3
Total Acres	45,416	100	132,886	100
Average Size	405		1136	

NOTE: Cereal grains include barley, oats and wheat.

Table 28. Use of Crops Grown by Average Response to Sale, Feed and Seed

Crops Grown	Sale (%)	Feed (%)	Seed (%)
Wheat	93	18	7
Oats	58	78	78
Barley	80	44	8
Rape	100	0	6
Flax	95	0	10
Other Crops	79	97	12

Table 29. Landowner Observation of Wildlife by Frequency of Sightings

Frequency of Sightings		Big Game	Upland Birds	Ducks	Geese	Other Wildlife
Not Seen	0	2	5	7	14	39
	1	23	23	13	33	2
	2	17	27	18	18	9
	3	29	17	13	14	16
	4	16	22	19	10	17
Frequently Seen	5	30	23	47	28	34

Table 30. Number of Habitat Areas on Farms Surveyed by Size

Size in Acres	1st Habitat Area	2nd Habitat Area	3rd Habitat Area
under 100	38	23	2
100 - 500	29	13	6
over 500	8	5	2
	75	41	10

Table 31. Number of Habitat Areas by Habitat Description

Habitat Description	Number of Habitat Areas	Percent	Cumulative Percent
Bush	54	46.2	46.2
Sloughs	33	28.2	74.4
Pasture Land	4	3.4	77.8
All Land	5	4.3	82.1
Damsite	4	3.4	85.5
Miscellaneous	17	14.5	100.0
	117	100.0	

Table 32. Number of Wildlife Damage Assistance Programs Idenfified by Landowner Description

Landowner Description	Number of Assistance Programs	Percent	Cumulative Percent
Alta Hail and Crop Insurance	13	27.1	27.1
Provincial Government	8	16.7	43.8
Ducks Unlimited	1	2.1	45.9
Municipalities	2	4.2	50.1
Wildlife Damage Fund	17	35.4	85.5
Miscellaneous	7	14.5	100.0
	48	100.0	

Table 33. Frequency of Landowner Comments Used to Rate Wildlife Damage Assistance Programs

Landowner Comments	Frequency	Percent	Cumulative Percent
Wait to Long for Estimate	2	5.7	5.7
Payment Delay	2	5.7	11.4
Low Compensation	13	37.1	48.5
Ineffecient Inspector	1	2.9	51.4
Good Inspector	7	20.0	71.4
Minor Assistance	5	14.3	85.7
No Assistance	5	14.3	100.0
	35	100.0	

Table 34. Number of Farm Adjustments Due to Wildfife Damages by Landowner Description

Landowner of Adjustments	Number of Adjustments	Percent	Cumulative Percent
Crop Pattern Changes	12	36.4	36.4
Drain/Fill Slough	3	9.1	45.5
Grain Drying	1	3.0	48.5
Fencing	1	3.0	51.5
Purchase New Machinery	1	3.0	54.5
Miscellaneous	13	39.5	94.0
Direct Combining	2	6.0	100.0
	33	100.0	

Table 35. Adjustments Which Benefit Wildlife by Landowners Description

Landowner Description of Adjustments	Number of Adjustments	Percent	Cumulative Percent
Leaving Habitat	5	17.9	17.9
Build Dugout	3	17.9	35.8
Undergrowth Encouraged	2	7.0	42.8
Leave Out Feed	1	3.6	46.4
Conscientious Crop Tech.	7	25.0	71.4
Provide Shelter	4	14.3	85.7
Miscellaneous	4	14.3	100.0
	28	100.0	

Table 36. Estimated Costs of Adjustments Due to Wildlife Damages and Adjustments Which Benefit Wildlife

Estimated Cost (Dollars)	Adjustments Due to Wildlife Damages	Adjustments to Benefit Wildlife
under 100	1	2
101 - 500	2	3
501 - 1,000	2	1
1,001 - 5,000	7	6
5,001 - 10,000	1	1
over 10,000	3	-
total	16	13

Table 37. Number of Actions Taken to Deter Wildlife Depredation by Estimated Cost

Estimated Cost (Dollars)	Number of Adjustment	Percent	Cumulative Percent
under 100	12	46.2	46.2
101 - 300	7	27.0	73.2
301 - 500	3	11.5	84.7
501 - 1000	3	11.5	96.2
over 1000	1	3.8	100.0
	26	100.0	

NOTE: Includes actions for which positive cost estimates are provided

Table 38. Frequency of Suggested Levels of Wildlife Damage Compensation

Suggested Compensation (%)	Frequency	Percent	Cumulative Percent
under 20	2	2.0	2.0
20 - 49	2	2.0	4.0
50 - 69	9	8.8	12.8
70 - 89	21	20.6	33.4
90 - 99	16	15.7	49.1
100	52	50.9	100.0
	102	100.0	

Table 39. Suggested Sources of Funding for Wildlife Damage Compensation by Percentage Contribution

Percentage Contribution	Federal Government	Hunters	Landowner Insurance	Provincial Government	Other Sources
10 - 30	26	28	17	26	7
31 - 50	41	27	4	53	4
51 - 70	1	1	1	5	-
71 - 90	1	1	2	7	-
91 - 100	2	1	2	11	-
under 10	-	6	-	1	-

Table 40. Influence of Wildlife Sanctuaries or Feeding Stations on Hunting

Effect	Frequency	Percent	Cumulative Percent
Positive Effect	4	13.8	13.8
Negative Effect	2	6.9	20.7
No Effect	21	72.4	93.1
Effect Not Specified	2	6.9	100.0
	29	100.0	

Table 41. Influence of Wildlife Sanctuaries or Feeding Stations on Wildlife Depredation

Effect	Frequency	Percent	Cumulative Percent
Increased Damages	1	2.9	2.9
Decreased Damages	3	8.6	11.5
No Effect	20	57.1	68.6
Effect Not Specified	11	31.4	100.0
	35	100.0	

Table 42. Potential Future Adjustments Due to Wildlife Depredation by Landowner Description

Description	Frequency	Percent	Cumulative Percent
Crop Pattern Alterations	4	40	40
Direct Combining / Grain Drying	1	10	50
Scare Tactics	1	10	60
Land Clearing	1	10	70
Ditching / Draining	2	20	90
Fencing	1	10	100.0
	10	100.0	

Table 43. Future Adjustments Due to Wildlife Depredation by Cost Estimates

Cost Estimate (Dollars)	Frequency	Percent	Cumulative Percent
under 100	1	16.6	16.6
101 - 1000	-	-	-
1001 - 5000	3	50.0	66.6
5001 - 10,000	1	16.7	83.3
over 10,000	1	16.7	100.0
	6	100.0	

Table 44. Survey of Respondents Receiving Compensation for Wildlife Depredation by Selected Variables, 1964-1981

Respondent	Quarter Sections Affected	Frequency of Damages (Years)	Total Actual Loss	Total Comp. Paid	Total Al. / Total Comp.	Total Al.- Total Comp.
1.	1	1	1,374	315	4.36	1,059
2.	5	3	11,496	2,298	5.00	9,198
3.	1	1	3,602	498	7.23	3,104
4.	1	2	3,776	2,318	1.63	1,458
5.	1	1	990	219	4.52	771
6.	1	1	737	249	2.96	488
7.	1	1	4,477	658	6.80	3819
8.	1	1	2,687	829	3.24	1,858
9.	1	1	2,111	673	3.14	1,438
10.	1	1	2,691	917	2.93	1,774
11.	1	2	5,717	2,191	2.61	3,526
12.	1	2	3,345	892	3.75	2,453
13.	1	3	4,821	1,679	2.87	3,142
14.	1	2	6,656	1,938	5.79	4,718
15.	1	7	10,422	3,358	3.10	7,064
16.	1	1	1,882	486	3.87	1,396
17.	1	1	971	446	2,18	525
18.	3	10	49,260	16,611	2.97	32,649

Table 44. Continued

Respondent	Quarter Sections Affected	Frequency of Damages (Years)	Total Actual Loss	Total Comp. Paid	Total Al. / Total Comp.	Total Al.- Total Comp.
19.	2	2	3,980	2,023	1.97	1,957
20.	1	2	1,923	958	2.01	964
21.	1	1	1,660	406	4.09	1,254
22.	1	1	1,245	589	2.11	656
23.	2	1	3,275	1,070	3.15	2,205
24.	1	1	3,376	942	3.58	2,434
25.	1	1	1,554	705	2.20	849
26.	2	1	6,060	2,040	2.97	4,020

Comp. = Compensation Paid; Al. = Actual Loss.

Table 45. Survey Respondents Actual Loss / Compensation Paid Ratios by Order Ranking

Respondent Rank	AL / CP	Total AL-Total Comp.	Frequency of Damages (Years)
1.	1.63	1,458	2
2.	1.97	1,957	2
3.	2.01	964	2
4.	2.11	656	1
5.	2.18	525	1
6.	2.20	849	1
7.	2.61	3,526	2
8.	2.87	3,142	3
9.	2.93	1,774	1
10.	2.96	488	1
11.	2.97	32,649	10
12.	2.97	4,020	1
13.	3.10	7,064	7
14.	3.14	1,438	1
15.	3.15	2,205	1
16.	3.24	1,858	1
17.	3.58	2,434	1
18.	3.75	2,453	2
19.	3.87	1,396	1
20.	4.09	1,254	1
21.	4.36	1,059	1
22.	4.52	771	1
23.	5.00	9,198	3
24.	5.79	4,718	2
25.	6.80	3,819	1
26.	7.23	3,104	1
	———	———	———
Average	3.09	3,645	1.96

XIII. APPENDIX G

Settlements for wildlife damage are administered by the Alberta Hail and Crop Insurance Corporation. Claims for wildlife damage are issued against the Wildlife Damage Fund. Inspectors from the Alberta Hail and Crop Insurance Corporation estimate the actual loss in revenue and the compensation to be paid for each landowner claim.

A. Calculation of Wildlife Damage Compensation

Four factors influence the amount of compensation to be paid. These factors are as follows:

1. The number of acres damaged by wildlife.
2. The extent of damage in the areas affected.
3. The maximum payment limit according to the Wildlife Damage Act.
4. The total amount of funds available is the Wildlife Damage Fund.

Each claim against the Wildlife Damage Fund is processed using an *adjusters report* and a *statement of claim* form. An example of an *adjusters report* on wildlife crop damage is provided on the following page. The *adjusters report* identifies the crop area affected by wildlife damage. Compensation is calculated according to the percentage of crop damage in each parcel of land affected. The *adjusters report* indicates those distinct parcels of land on which crops are damaged due to wildlife depredation. The size of the three land parcels affected are 40 acres, 30 acres and 5 acres. However, the entire 75 acre area is not damaged to the same extent. Damage percentages for each land parcel are indicated in the form row entitled LOSS BY COUNT. These percentages are 91 percent, 68 percent and 30 percent respectively. Notice that damage percentages are grouped into three categories. Crops damaged at a level less than 10 percent are not considered. Damages from 10 percent to 90 percent are calculated as such, whereas damages to crops greater than 90 percent are calculated at the 100 percent level.

The information from the adjusters report is processed on a corresponding *statement of claim*. In addition, the land description, type of crop affected, and maximun coverage per acre are specified. Maximum coverage limitations are indentified in chapter 2. Since 1978, the maximum coverage limitation has been the lesser of $50 per acre or 75 percent of the total actual loss incurred. An example of a *statement of claim* is provided on page 129. To obtain the total settlement of this claim the percent damage for

ADJUSTER'S REPORT AND RECOMMENDATION
ON WILDLIFE CROP DAMAGE

GENERAL INFORMATION

CLAIM# 1 CLAIM No. W 405-168

ADDRESS Donald

CROP DAMAGED BY: ANTELOPE ____ BEAR ____ DEER ____ DUCKS ✓

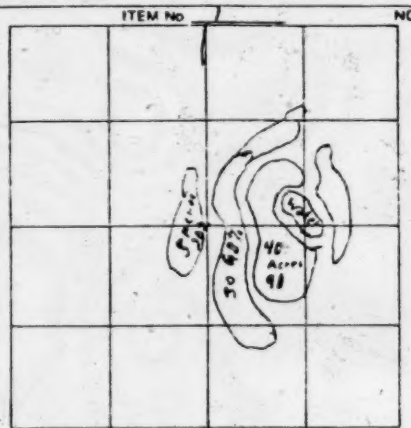
ELK ____ GEESE ____ MOOSE ____ SANDHILL CRANE ____ OTHER ____

For each item map entire seeded acreage of that particular crop on the quarter section

Indicate acres harvested and or not claimed on and all damaged acreage locating by counts the total percentage of loss to date

(Each small block represents 10 acres)

ITEM No 1 — NORTH



Pt E½ Sec 23 Twp 42 R 18 M 4

Crop Rly Seeded Acres 300

Summerfallow, Stubble, etc Fallow

ITEM No ____

Pt ____ Sec ____ Twp ____ R ____ M ____

Crop ____ Seeded Acres ____

Summerfallow, Stubble, etc ____

Count No	1	2	3	4	5	6	7	8	9	Totals
Stalks Counted	100	100	100	100	100	100	100	100	100	
Acreage Each Count	40	30	5							75
Loss by Count	91	68	30							189

Count No	1	2	3	4	5	6	7	8	9	Totals
Stalks Counted	100	100	100	100	100	100	100	100	100	
Acreage Each Count										
Loss by Count										

No allowance for loss under 10%

225 Not claimed on (103)

____ under 10% ____ ÷ ____ = NIL

____ ____ ÷ ____ = ____

5 } 10-90% 30 ÷ 1 = 30

30 } 68 ÷ 1 = 68

40 over 90% 91 ÷ 1 = 100

300 TOTALS 189

____ Not claimed on

____ under 10% ____ ÷ ____ = NIL

____ ____ ÷ ____ = ____

____ } 10-90% ____ ÷ ____ = ____

____ } ____ ÷ ____ = ____

____ over 90% ____ ÷ ____ = 100

____ TOTALS ____

Yield in (Kg) ____ per acre prior to damage 1308

Yield in Kg Tonnes per acre prior to damage ____

HEAD OFFICE USE ONLY

Price Allowance per unit .10

Crop Value per acre prior to damage $ 145.88

Price Allowance per Unit ____

Crop Value per acre prior to damage ____

RECEIVED
SEP 16 1982

I agree to the above report and accept the percentage loss as being an accurate estimate of the damage done to my crops by WILDLIFE to this date

Date of Inspection | ADJUSTER | Claimant or Authorized Representative

each land parcel affected is multiplied by the maximum coverage per acre. The result in then multiplied by the number of acres within the particular land parcel affected. Thus, for the statement of claim provided, the calculation is:

(.30 x 50.00)	x	5	=	75.00
(.68 x 50.00)	x	30	=	1,020.00
(.100 x 50.00)	x	40	=	2,000.00
total compensation				3,095.00

In addition to the calculation shown, fees for registering claims ($25 per section of land or postion there of) are refunded to the claimant where damage is calculated at $100 or greater. Claims for damages calculated at less than $100 are not considered. In the example, a $50 registration fee had been paid by the claimant and must be included in the settlement of damage.

Damage settlements to claimants have been prorated in two of the 19 years from 1964 to 1982 due to a lack of funds. Table 46, page 130, provided by the Alberta Hail and Crop Insurance Corporation, shows that all settlements in 1971 and 1978 are prorated by 86.15 percent and 61.29 percent respectively. The statement of claim provided pertains to wildlife damage compensation paid in 1983. Settlements paid in 1983 refer to damages incurred the previous year. According to Table 46, page 130, settlements for claims initiated in 1982 were not prorated. Consequently, the full $3,145 indicated on the *statement of claim* was payable to the claimant.

B. Calculation of Actual Loss

In addition to estimating percentage damage and acres affected adjusters with the Alberta Hail and Crop Insurance Corporation calculate actual losses in revenue incurred by claimants. Two factors influence these calculations. These factors are as follow:

1. Yield in kilograms per acre prior to damage.
2. Price allowance per kilogram of damage crop.

During the damage inspection adjusters estimate a potenital yield in kilograms from the crop damaged by wildlife. This estimated yield is multiplied by a predetermined value for each grain set by Ministerial order. Values for each grain for 1982 are presented in Table 47, page 131.

WILDLIFE DAMAGE FUND OF ALBERTA

STATEMENT OF CLAIM

APR 19,83

CLAIM NO. 82W 16

4405

DONALDA ALTA TOB 1HO

LAND DESCRIPTION	CROP	ACRES DAMAGED	PERCENT DAMAGE	COVERAGE PER ACRE	LOSS
E 23 042 18 4	BARLEY	225		50.00	.00
E 23 042 18 4	BARLEY	5	30	50.00	75.00
E 23 042 18 4	BARLEY	30	68	50.00	1,020.00
E 23 042 18 4	BARLEY	40	100	50.00	2,000.00
		A	B	C	

(B x C) x A

SUMMARY OF PAYMENT

TOTAL LOSS	$	3,095.00
TOTAL PAYMENT AT 100.00 PERCENT	$	3,095.00
PLUS REGISTRATION FEE REFUNDED	$	50.00
OUTSTANDING PREMIUM ALBERTA HAIL AND CROP INSURANCE	$	.00
NET AMOUNT PAYABLE	$	3,145.00
CHEQUE 10 HEREWITH FOR 100.0 PERCENT SHARE	$	3,145.00

NOTE TOTAL PAYMENT PERCENTAGE OF 100.00 IS TOTAL AMOUNT AVAILABLE IN FUND DIVIDED BY TOTAL AMOUNT OF CLAIMS SUBMITTED DURING 1982

Table 46

WILDLIFE DAMAGE FUND OF ALBERTA

		NO. OF CLAIMS	AWARDS	PRORATED	REGISTRATION FEES	MISCELLANEOUS EXPENSES	TOTAL NET COST
^^	1961	2	$ 140			$ 2,834	$ 2,974
^^	1962	9	1,459			1,373	2,832
^^	1963	21	5,448			1,623	7,071
	1964	702	319,464	100%	$ (18,550)	25,791	326,705
	1965	523	207,753	100%	(15,100)	22,471	215,124
	1966	445	158,130	100%	(13,600)	23,978	168,508
	1967	76	28,222	100%	(2,700)	8,178	33,700
	1968	822	387,945	100%	(27,525)	33,577	393,997
	1969	1,719	802,742	100%	(49,549)	43,819	797,012
	1970	1,095	419,537	100%	(29,675)	24,888	414,750
	1971	887	338,850	86.15%	(22,998)	30,627	346,479
	1972	1,065	509,160	100%	(27,900)	34,339	515,599
	1973	1,387	935,357	100%	(42,464)	37,150	930,043
	1974	1,509	957,449	100%	(90,150)	53,139	970,248
	1975	790	506,019	100%	(22,650)	35,775	519,144
	1976	641	383,952	100%	(19,050)	34,251	399,153
	1977	1,974	1,562,297	100%	(58,450)	73,149	1,576,996
	1978	1,389	1,219,559	61.29%	(41,125)	65,510	1,243,944
	1979	758	886,494	100%	(21,325)	59,276	924,445
	1980	1,185	1,659,359	100%	(38,250)	90,377	1,711,486
^^^	1981	403	516,071	100%	(1,000)	51,395	566,466
	1982	490	665,598	100%	---	60,239	725,837
			$12,471,005		$(492,261)	$813,759	$12,792,503

^^ Premiums were collected during first three years

^^^Registration fees returned to claimants.

Table 47. Values for Grain Under the Wildlife Damage Fund for 1982

Grain	Value (cents/kg)
Spring Wheat	15
Durum Wheat	15
Utility Wheat	14
Soft White Spring Wheat	14
Winter Wheat	14
Oats	10
Barley	12
Mixed Grain	10
Rye (Spring and Fall)	13
Rapeseed	25
Mustard	22
Flax	26

According to the adjusters report presented, the yield prior to damage for claim No. W405.168 is estimated at 1308 kg. per acre. The predetermined value for barley shown in Table 47 is 12 cents per kilogram. Consequently, the value of crops affected prior to damage is estimated at (1308 x .12) $ 143.88 per acre.

XIV. APPENDIX H

CONFIDENTIAL

ALBERTA MIGRATORY BIRD GAME HUNTING

RESIDENT SURVEY

1982 HUNTING SEASON

1. Residence (nearest city or town) _____

2. Age _____

3. Please indicate where you spent the majority of your youth:

   ___ Rural Area (less than 1,000 population)

   ___ Town (1,000 to 10,000 population)

   ___ City (over 10,000 population)

4. Sex: Male ___ Female ___

5. Occupation _____

6. Including yourself, how many of your immediate family are living at your residence (please circle).

   1 2 3 4 5 6 7 8 9

7. Approximately what was the total amount of money earned by you and your family in 1982?

$5,000 or less __	$25,001-$30,000 __	$50,001-$55,000 __
$5,001-$10,000 __	$30,001-$35,000 __	$55,001-$60,000 __
$10,001-$15,000 __	$35,001-$40,000 __	$60,001-$65,000 __
$15,001-$20,000 __	$40,001-$45,000 __	$65,001-$70,000 __
$20,001-$25,000 __	$45,001-$50,000 __	$70,001-OR OVER __

8. Education (please circle highest year completed)

   Grade School 0 1 2 3 4 5 6 7 8 9

   High School 10 11 12

   University 1 2 3 4 5 6 7 8 9

   Technical School 1 2 3 4

9. Please respond to each question below by checking the appropriate answer:

   a. Have you ever hunted waterfowl (ducks or geese) before the 1982 season?

   YES __ NO __

b. Have you ever hunted waterfowl (ducks or geese) in Alberta before the 1982 season?

YES __ NO __

10. Please indicate the number of years of hunting experience you have had for the following catagories:

a. Waterfowl _____ years

b. Upland Bird Game _____ years

c. Big Game _____ years

11. What are the main reasons that you go hunting ?

Rank your reasons in order of importance (1st, 2nd, etc.);

a. For Meat ___

b. For a Trophy ___

c. For Outdoor Enjoyment ___

d. For Companionship ___

e. For Exercise ___

f. Other (please specify) _____ (rank) ___

12. Did you hold a Federal Migratory Game Bird Hunting Permit in 1982?

YES __ NO __

13. Which Alberta licenses did you hold in 1982 ?

(_) Bird Game (_) Trophy Sheep

(_) Mule Deer (_) Moose

(_) Whitetailed Deer (_) Elk

(_) Angling License (_) Cougar

(_) Grizzly Bear (_) Black Bear

(_) Bow Hunting (_) Special License (please specify) _____

14. Do you own agricultural land in Alberta: (that includes at least 80 acres of cultivated land)

YES __ NO __

15. Are you aware of any programs available in Alberta to compensate grain producers for losses resulting from waterfowl damage to crops? (check one)

YES __ NO __

16. Do you feel that landowners should be compensated for such crop damage?

YES __ NO __

IF "YES", compensation should be paid on the basis of (check one):

__ Production costs - cash outlay (costs incurred in planting etc.)

__ Market value of crop lost

__ Other (please specify) _____

What percentage of the compensation basis indicated above should be given to grain producers?

Percentage _____ (0 to 100%)

Of the percentage of compensation indicated, where should the funding for this compensation come from? (Example: Source Alberta Government 15 percent; Source Hunters 10 percent, etc.)

Source _____ _____ percent

Source _____ _____ percent

Source _____ _____ percent

17. Are you aware of any "feeding station" or "lure crop" programs in Alberta?

YES __ NO __

IF "YES", do you feel that they had any effect on your hunting activities (please comment). _____

18. Is habitat available for use by waterfowl in Alberta disappearing?

YES __ NO __

IF "YES", is such disappearance affecting your hunting experience with ducks and geese?

YES __ NO __

19. Does crop damage by ducks and geese to grain crops in Alberta have any bearing on habitat disappearance?

YES __ NO __

Please comment: _____

20. a. Have you ever belonged to the Alberta Fish and Game Association?

If "yes", how many years? _____ years

Were you a member of the Alberta Fish and Game Association in 1982?

Yes __ NO __

b. Are you now, or have you ever been a member of other wildlife associations, wildlife organizations or hunting clubs?

If "yes", please specify group name and length as member.

Group Name _____ length of time _____ years

Group Name _____ length of time _____ years

c. If you have answered "yes" to part (a) or part (b), please comment on why you belong to these groups and what benefits you gain by being a member.

_____

_____

_____

21. Did you hunt waterfowl at least once during the 1982 hunting season in Alberta?

NO __ If "NO" please return this questionaire in the self addressed envelope that has been provided. Your cooperation is greatly appreciated.

YES __ If "YES" please complete the questions that follow.

22. Please complete the following information for each waterfowl hunting area visited in 1982 in Alberta (NOTE: 1 full day of hunting is 4 or more hours in the activity; please include time spent "spotting" or "scouting").

Area No. 1

Nearest town or landmark: _____

Number of waterfowl hunting trips to area: ____ trips

Number of days of waterfowl hunting in area: ____ days

Number of ducks bagged by yourself in area: ____ ducks

Number of geese bagged by yourself in area: ____ geese

Average number in hunting party including yourself in each trip to area: ____ persons

Estimated total number of miles travelled to and from the area: ____ miles

Area No. 2

Nearest town or landmark: _____

Number of waterfowl hunting trips to area: ____ trips

Number of days of waterfowl hunting in area: ____ days

Number of ducks bagged by yourself in area: ____ ducks

Number of geese bagged by yourself in area: ____ geese

Average number in hunting party including yourself in each trip to area: ____ persons

Estimated total number of miles travelled to and from the area: ____ miles

Area No. 3

Nearest town or landmark: _____

Number of waterfowl hunting trips to area: ____ trips

Number of days of waterfowl hunting in area: ____ days

Number of ducks bagged by yourself in area: ____ ducks

Number of geese bagged by yourself in area: ____ geese

Average number in hunting party including yourself in each trip to area: ____ persons

Estimated total number of miles travelled to and from the area: ____ miles

Area No. 4

Nearest town or landmark: _____

Number of waterfowl hunting trips to area: ____ trips

Number of days of waterfowl hunting in area: ____ days

Number of ducks bagged by yourself in area: ____ ducks

Number of geese bagged by yourself in area: ____ geese

Average number in hunting party including yourself in each trip to area: ____ persons

Estimated total number of miles travelled to and from the area: ____ miles

Area No. 5

Nearest town or landmark: _____

Number of waterfowl hunting trips to area: ____ trips

Number of days of waterfowl hunting in area: ____ days

Number of ducks bagged by yourself in area: ____ ducks

Number of geese bagged by yourself in area: ____ geese

Average number in hunting party including yourself in each trip to area: ____ persons

Estimated total number of miles travelled to and from the area: ____ miles

23. Based on your experience, how would you generally rate your hunting trips for ducks and geese in Alberta in 1982? (check one only for ducks and one only for geese)

Ducks: (_)VERY GOOD (_)GOOD (_)FAIR (_)POOR (_)VERY POOR

Geese: (_)VERY GOOD (_)GOOD (_)FAIR (_)POOR (_)VERY POOR

24. Please estimate as best you can the amount of money you personally spent for waterfowl hunting in Alberta, in 1982. Please estimate for each catagory as it applies to you.

a. Travel Costs $___ . __

(includes gasoline, oil, air fare, etc.)

b. Lodging $___ . __

(includes hotels, motels, camping fees, etc.)

c. Food $___ . __

(includes restaurant meals, food purchased for camping, etc.)

d. Beverages $___ . __

e. Rentals $___ . __

(includes rental of hunting equipment)

f. Ammunition $___ . __

g. Hunting Services $___ . __

(includes taxidermy, etc.)

h. Other $___ . __

(please specify)_____

25. If you made any major purchases for hunting in 1982 that are used in whole or in part for hunting ducks or geese in Alberta, please list the item, the purchase price and the extent to which this item is used for waterfowl hunting in Alberta.

a. ITEM_____ PURCHASE PRICE _____

Percentage of Total Use for Which This Item is Devoted Solely to Waterfowl Hunting in Alberta (circle one)

2% 5% 10% 25% 50% 75% 100% OTHER___%

b. ITEM_____ PURCHASE PRICE _____

Percentage of Total Use for Which This Item is Devoted Solely to Waterfowl Hunting in Alberta

2% 5% 10% 25% 50% 75% 100% OTHER___%

c. ITEM_____ PURCHASE PRICE _____

Percentage of Total Use for Which This Item is Devoted Solely to Waterfowl

Hunting in Alberta

2% 5% 10% 25% 50% 75% 100% OTHER___%

26. The following questions are hypothetical, only intended to give us information that is difficult to obtain without using an imaginary situation. Please read the questions carefully and answer if possible. Thank you.

a. When you participated in waterfowl hunting activities in Alberta, in 1982, how much value in **dollars per day** was it worth to you in addition to the amounts you spent on travel and other expenses. (circle the appropriate value)

Average Dollar Value per Day

$	5	10	15	20	25	30	35	40	45	50
$	55	60	65	70	75	80	85	90	95	100

Higher or other dollar value (specify) $_____

b. Approximately how much money would you have to be paid not to hunt waterfowl in Alberta **for one year** . (Estimate and circle the least amount acceptable to you)

$	0	1	2	3	4	5	6	7	8	9
$	10	20	30	40	50	60	70	80	90	
$	100	200	300	400	500	600	700	800	900	

If higher or other dollar value, please specify: $_____

27. Give any additional comments that might help evaluate migratory bird game hunting in Alberta.

_____

_____

_____

YOUR COOPERATION IS GREATLY APPRECIATED

CONFIDENTIAL

ALBERTA MIGRATORY BIRD GAME HUNTING

NONRESIDENT SURVEY

1982 HUNTING SEASON

1. Residence (nearest city or town) _____

   (state or prov.) _____

   (country) _____

2. Age _____

3. Please indicate where you spent the majority of your youth:

   ___ Rural Area (less than 1,000 population)

   ___ Town (1,000 to 10,000 population)

   ___ City (over 10,000 population)

4. Sex: Male ___ Female ___

5. Occupation _____

6. Including yourself, how many of your immediate family are living at your residence (please circle).

   1 2 3 4 5 6 7 8 9

7. Approximately what was the total amount of money earned by you and your family in 1982? (In Canadian Dollar Equivalents)

$5,000 or less __	$25,001-$30,000 __	$50,001-$55,000 __
$5,001-$10,000 __	$30,001-$35,000 __	$55,001-$60,000 __
$10,001-$15,000 __	$35,001-$40,000 __	$60,001-$65,000 __
$15,001-$20,000 __	$40,001-$45,000 __	$65,001-$70,000 __
$20,001-$25,000 __	$45,001-$50,000 __	$70,001-OR OVER __

8. Education (please circle highest year completed)

   Grade School 0 1 2 3 4 5 6 7 8 9

   High School 10 11 12

   University 1 2 3 4 5 6 7 8 9

   Technical School 1 2 3 4

9. Please respond to each question below by checking the appropriate answer:

   a. Have you ever hunted waterfowl (ducks or geese) before the 1982 season?

YES __ NO __

b. Have you ever hunted waterfowl (ducks or geese) in Alberta before the 1982 season?

YES __ NO __

10. Please indicate the number of years of hunting experience you have had for the following catagories:

a. Waterfowl _____ years

b. Upland Bird Game _____ years

c. Big Game _____ years

11. What are the main reasons that you go hunting ?

Rank your reasons in order of importance (1st, 2nd, etc.):

a. For Meat ___

b. For a Trophy ___

c. For Outdoor Enjoyment ___

d. For Companionship ___

e. For Exercise ___

f. Other (please specify) _____ (rank) ___

12. Did you hold a Federal Game Bird Hunting Permit in 1982?

YES __ NO __

13. Which Alberta licenses did you hold in 1982 ?

(_) Bird Game (_) Special Trophy Sheep

(_) Mule Deer (_) Moose

(_) Whitetailed Deer (_) Elk

(_) Angling License (_) Cougar

(_) Grizzly Bear (_) Black Bear

(_) Bow Hunting (_) Wolf

(_) Zone One Moose (_) Special License (please specify) _____

14. Are you aware of any programs available in Alberta to compensate grain producers for losses resulting from waterfowl damage to crops? (check one)

YES __ NO __

15. Do you feel that landowners should be compensated for such crop damage?

YES __ NO __

IF "YES", compensation should be paid on the basis of (check one):

__ Production costs - cash outlay (costs incurred in planting etc.)

__ Market value of crop lost

__ Other (please specify) _____

What percentage of the compensation basis indicated above should be given to grain producers?

Percentage _____ (0 to 100%)

Of the percentage of compensation indicated, where should the funding for this compensation come from? (Example: Source Alberta Government __ 15 percent; Source Hunters __ 10 percent, etc.)

Source _____ _____ percent

Source _____ _____ percent

Source _____ _____ percent

16. Are you aware of any "feeding station" or "lure crop" programs in Alberta?

YES __ NO __

IF "YES", do you feel that they had any effect on your hunting activities (please comment). _____

17. Is habitat available for use by waterfowl (ducks and geese) in Alberta disappearing?

YES __ NO __

IF "YES", is such disappearance affecting your hunting experience with waterfowl?

YES __ NO __

18. Does crop damage by waterfowl to grain crops in Alberta have any bearing on habitat disappearance?

YES __ NO __

Please comment: _____

19. a. Are you now, or have you ever been a member of any fish and game association, wildlife organization or hunting club?

YES __ NO __

If "yes", please specify group name and length as a member.

Group Name _____ length of time _____ years

Group Name _____ length of time _____ years

Please comment on why you belong to these groups and what benefits you gain by being a member.

_____

_____

_____

20. Did you hunt waterfowl at least once during the 1982 hunting season in Alberta?

NO __ If "NO" please return this questionaire in the self addressed envelope that has been provided. Your cooperation is greatly appreciated.

YES __ If "YES" please complete the questions that follow.

21. Approximately what percentage of your **annual time spent hunting** did you spend hunting waterfowl in Alberta in the 1982 season ? (circle one)

100% 75% 50% 40% 30% 20% 10% 5% 1%

If other, please specify ___%

22. Please complete the following information for each waterfowl hunting trip taken in 1982 in Alberta (NOTE: 1 full day of hunting is 4 or more hours in the activity; please include time spent "spotting" or "scouting").

Trip No. 1

Areas Hunted (town, landmark or WMU) _____

Days Hunted in Area (estimate to nearest one half day) ___

No. in Hunting Party (including yourself) _____

Game Hunted in the Area _____

Game Bagged by Yourself (type and number) _____

Trip No. 2

Areas Hunted _____

Days Hunted ___ No. in Party ___

Game Hunted in the Area _____

Game Bagged by Yourself _____

Trip No. 3

Areas Hunted _____

Days Hunted ___ No. in Party ___

Game Hunted in the Area _____

Game Bagged by Yourself _____

23. Was waterfowl hunting the main purpose of your trip ? (If "NO", what was the main purpose ?)

a. 1st Trip: YES ___ NO ___ Main Purpose _____

b. 2nd Trip: YES ___ NO ___ Main Purpose _____

c. 3rd Trip: YES ___ NO ___ Main Purpose _____

24. Based on your experience, how would you generally rate your hunting trips for ducks and geese in Alberta in 1982? (check one only for ducks and one only for geese).

Ducks: (_)VERY GOOD (_)GOOD (_)FAIR (_)POOR (_)VERY POOR

Geese: (_)VERY GOOD (_)GOOD (_)FAIR (_)POOR (_)VERY POOR

25. Please estimate as best you can the amount of money you personally spent for waterfowl hunting in Alberta, in 1982. Please indicate **total trip expenditures** for all trips. (In Canadian Dollar Equivalents)

a. Travel Costs $___ . __

(includes gasoline, oil, air fare, etc.)

b. Lodging $___ . __

(includes hotels, motels, camping fees, etc.)

c. Food $___ . __

(includes restaurant meals, food purchased for camping, etc.)

d. Beverages $___ . __

e. Rentals $___ . __

(includes rental of hunting equipment)

f. Guides $___ . __

(includes guiding fees, etc.)

g. Ammunition $___ . __

h. Hunting Services $___ . __

(includes taxidermy, etc.)

i. Other $___ . __

(please specify)_____

26. Approximately how much of the above was spent in Alberta ?

a. Travel Costs $___.__

b. Lodging $___.__

c. Food $___.__

d. Beverages $___.__

e. Rentals $___.__

f. Guides $___.__

g. Ammunition $___.__

h. Hunting Services $___.__

i. Other $___.__

27. The following questions are hypothetical, only intended to give us information that is difficult to obtain without using an imaginary situation. Please read the questions carefully and answer if possible. Thank you.

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28. Give any additional comments that might help evaluate waterfowl hunting in Alberta.

_____

_____

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